



Getting Inquisitive About The AI of DA: Inquisition

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Dragon Age: Inquisition

- 1st on Frostbite
- 3rd game in the series
- 5 platforms
- Open exploration areas



AI for Creatures

- Big ones



AI for Creatures

- Big ones
- Small ones



AI for Creatures

- Big ones
- Small ones
- Friendly ones



AI for Creatures

- Big ones
- Small ones
- Friendly ones
- Nasty ones



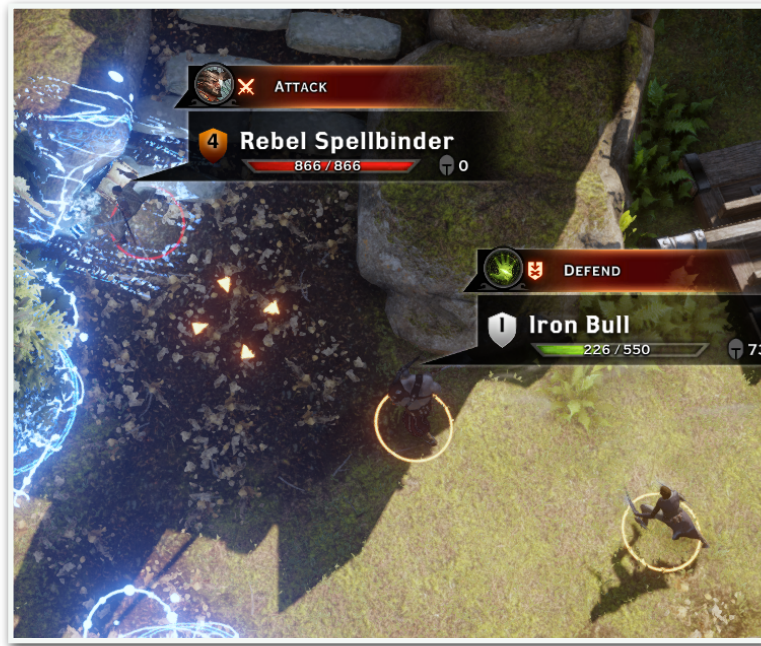
AI for Party Members

- Variety of roles and capabilities
- Player switch control



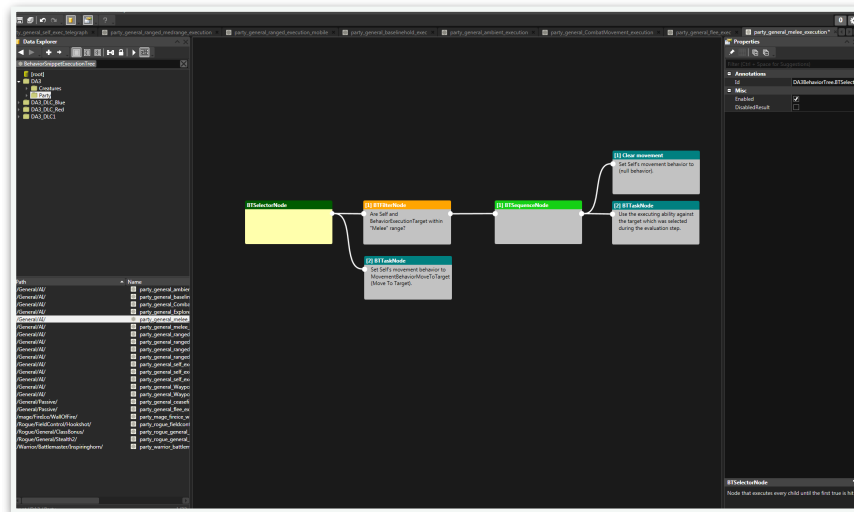
AI for Party Members

- Variety of roles and capabilities
- Player switch control
- Tactical Mode



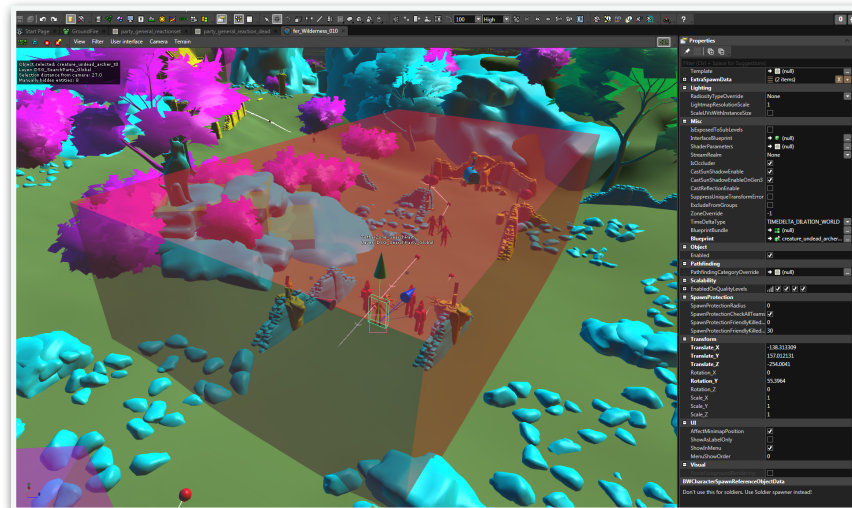
AI for Designers

- Iteration speed
 - Data driven
- Combat designers



AI for Designers

- Iteration speed
 - Data driven
- Combat designers
- Level designers



Today's Focus

- Adapting to open areas
- Party AI
- Development story



The Toolbox

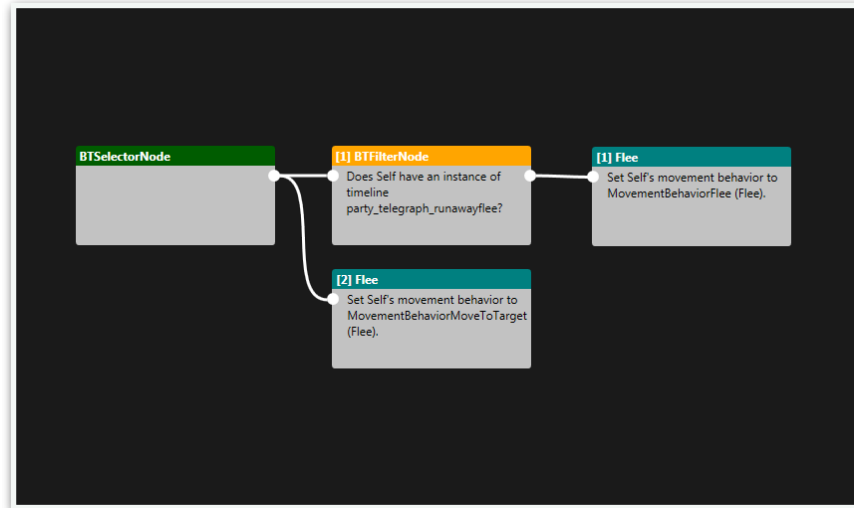
NavPower

- Integrated into Frostbite
- Path mesh & navigation
- Move to Position,
Follow Leader



Decision Tree

- Principal AI logic flow
 - Visual node editor
 - Conditional evaluators
 - Drives game systems



Ability Based Gameplay

- Character actions
 - Party members
 - NPC creatures
- Fireball, Taunt, Dodge
- Jump, Drink Potion, Twitch

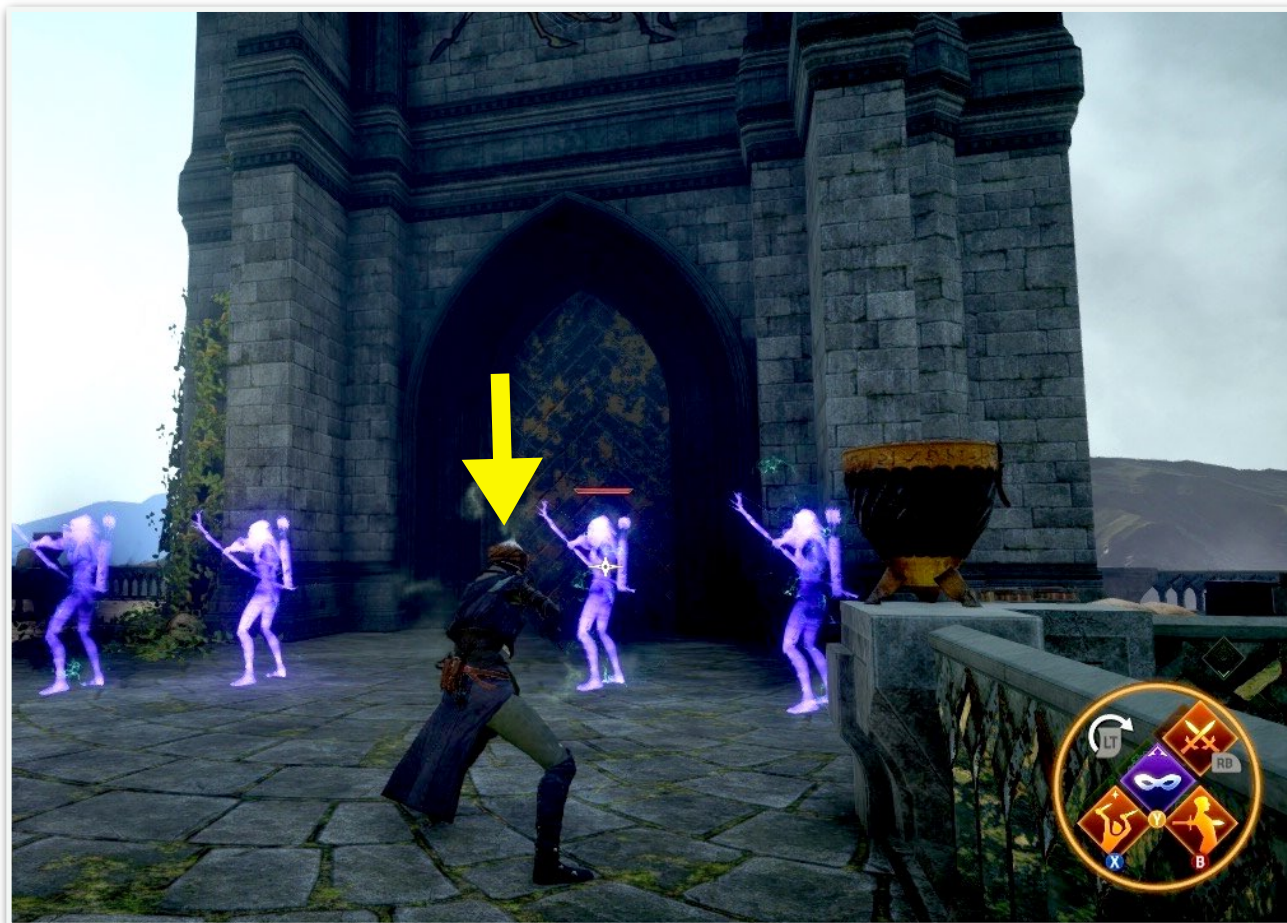


Big Big World

Problem: Consistent Approach

- Tackling the massive scope of the game
- Shared approach across creatures and party



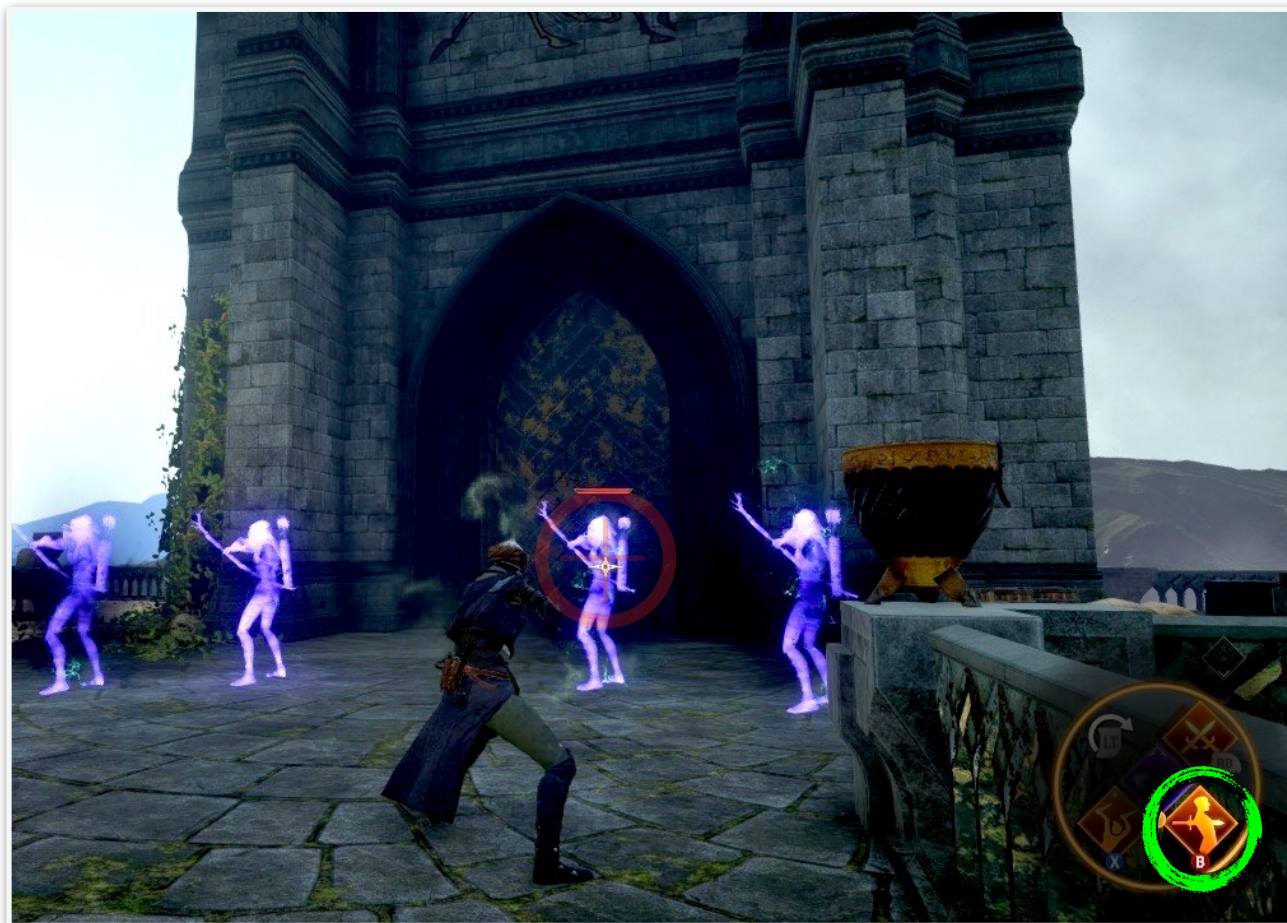




Target



Target Ability



Target
Ability
Movement

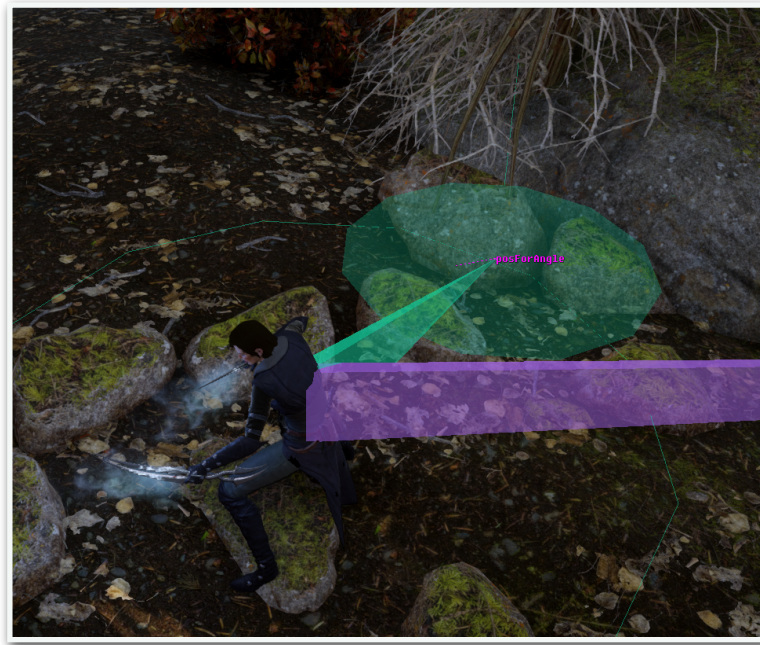


Target
Ability
Movement
Execute



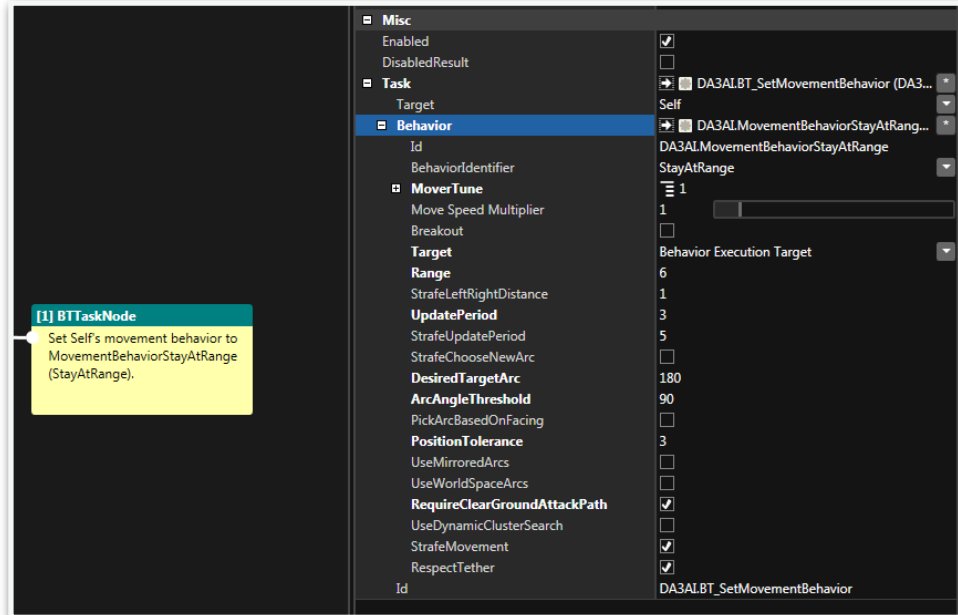
Problem: Advanced Movement

- Pathfinding layer is basic
 - Move to Point,
Follow Leader
- More complex movement as reusable abstractions



Movement Behaviours

- Reusable & parameterized
- Stay at range
- Find cover
- Prey flee behaviour
- Hold position



Problem: Big Open Zones

- DAO and DA2 had more tightly gated combats
- Previous edge cases became common
 - Walk away from a fight

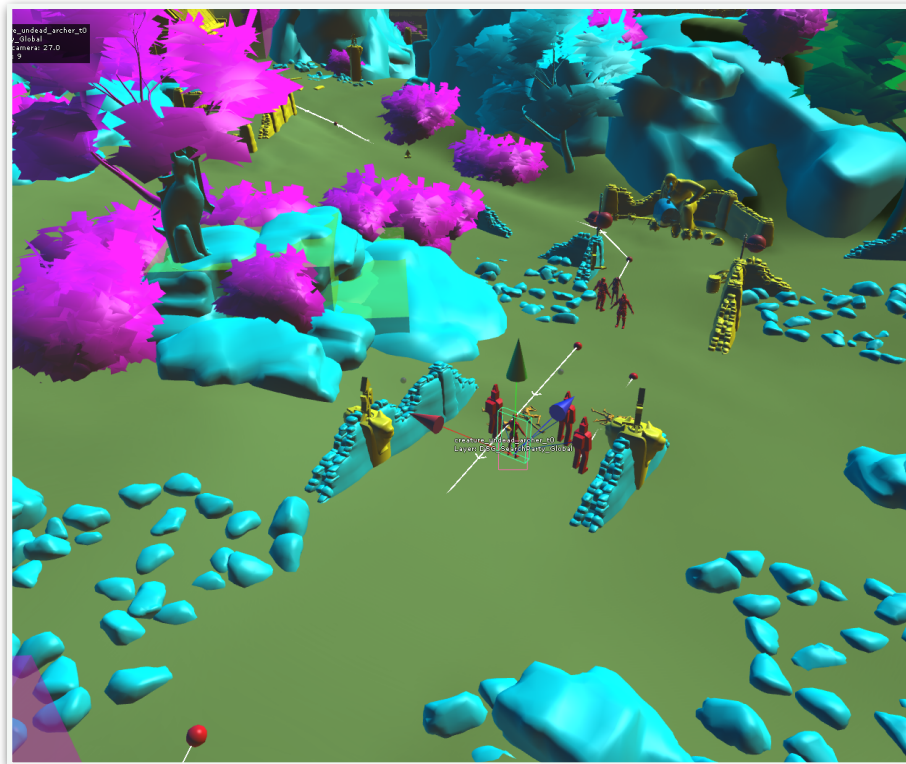


Big Open Zones

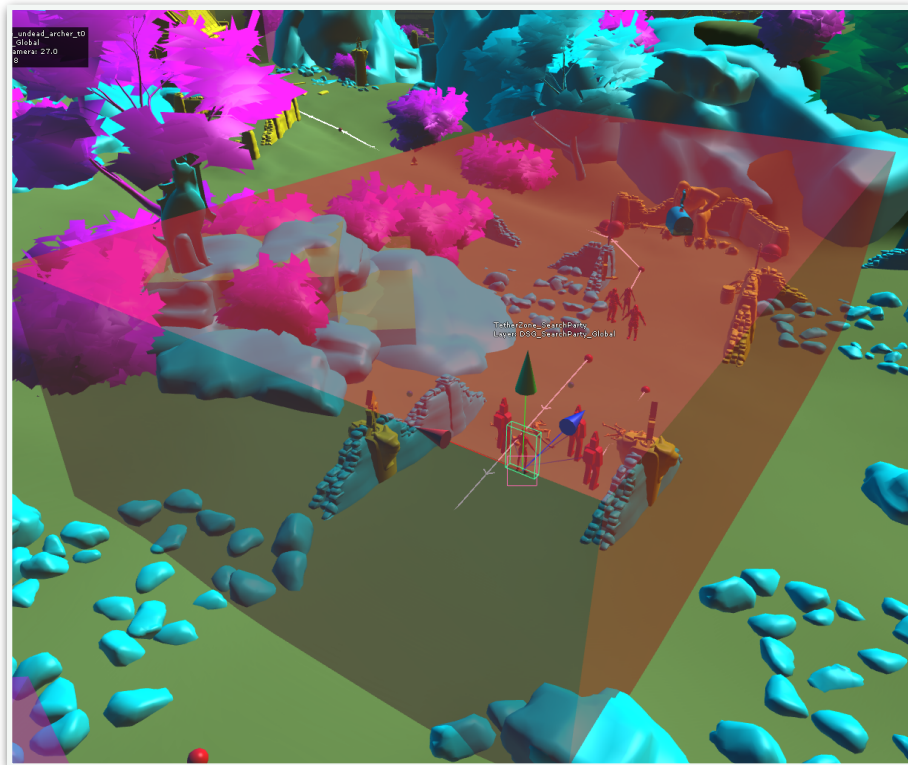
- Area streaming
- Type and instance memory budgets
- Gameplay balance and designer control



Tether System

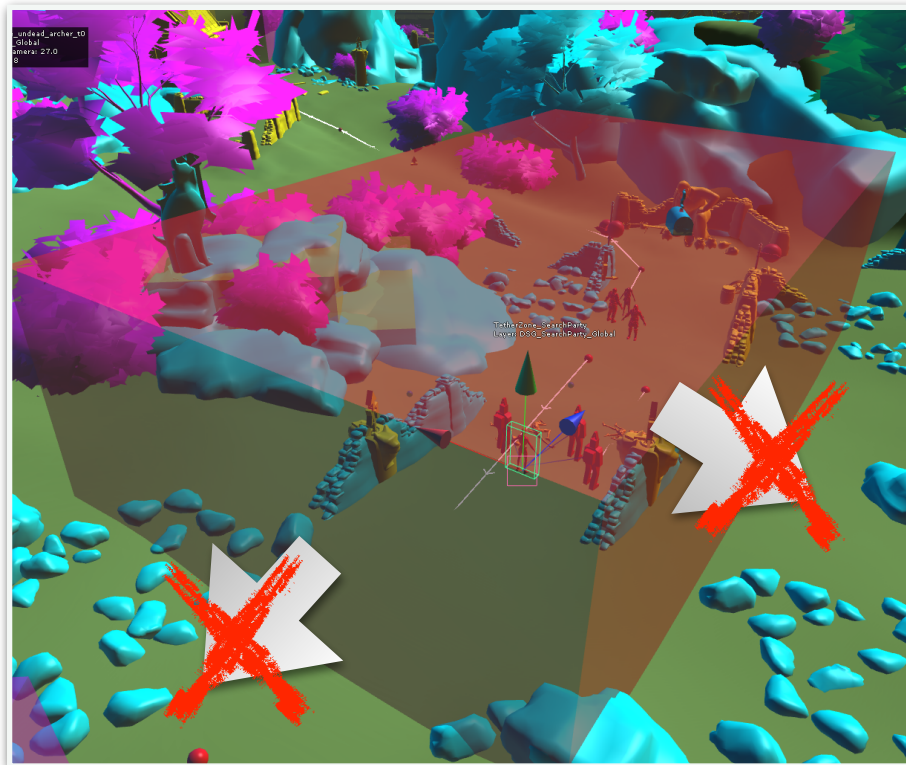


Tether System



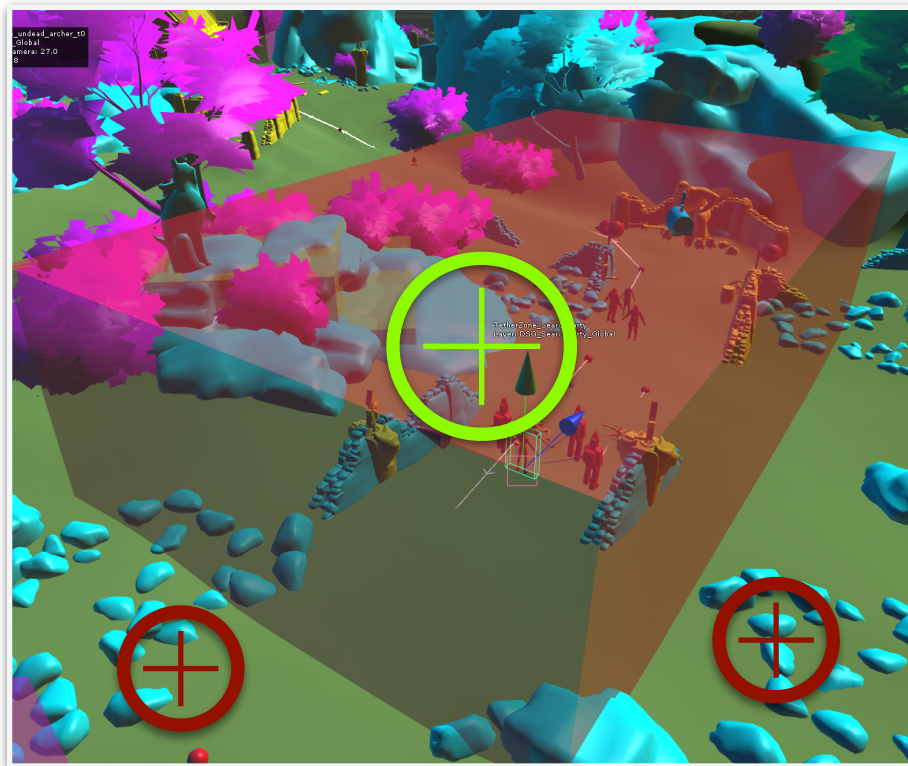
Tether System

1. Don't leave



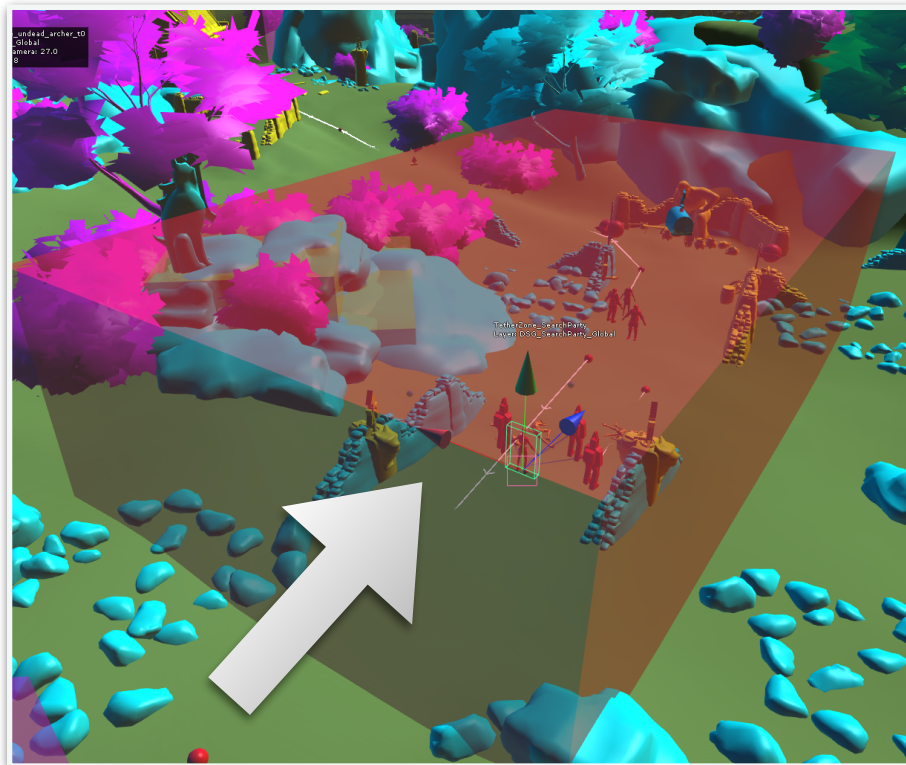
Tether System

1. Don't leave
2. Target inside is better than target outside



Tether System

1. Don't leave
2. Target inside is better than target outside
3. If outside, go home



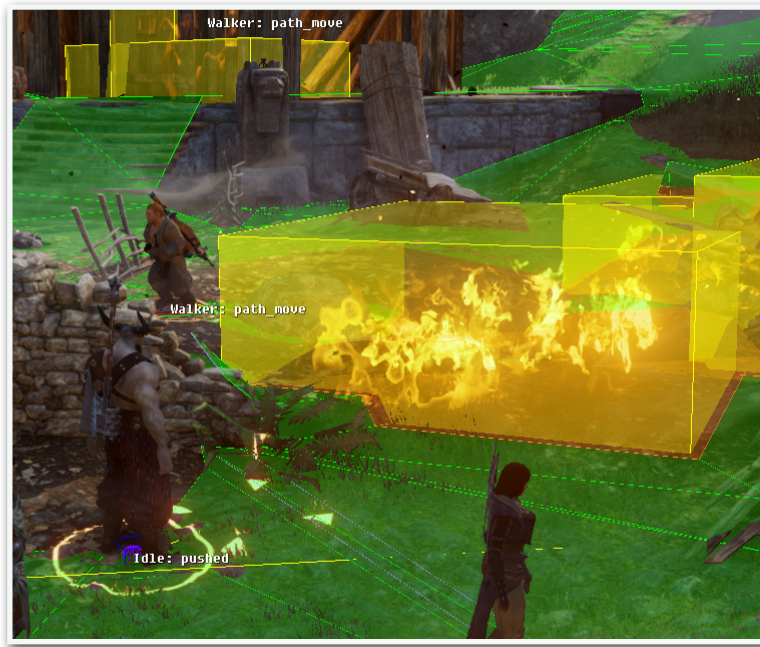
Problem: Don't Go There

- Hazards that you *can* stand in but *shouldn't*
- Can appear dynamically



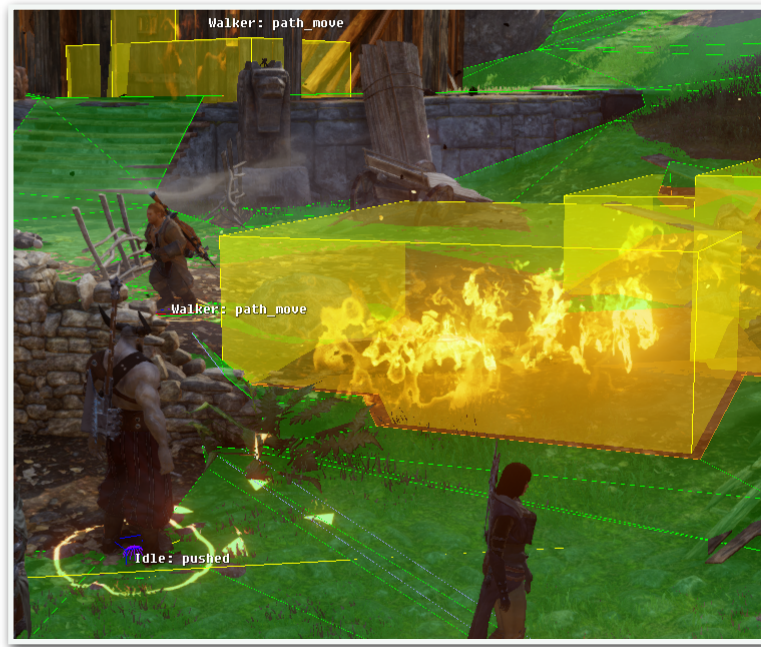
Fear Zones

- Pathfinding obstacle:
Don't walk in



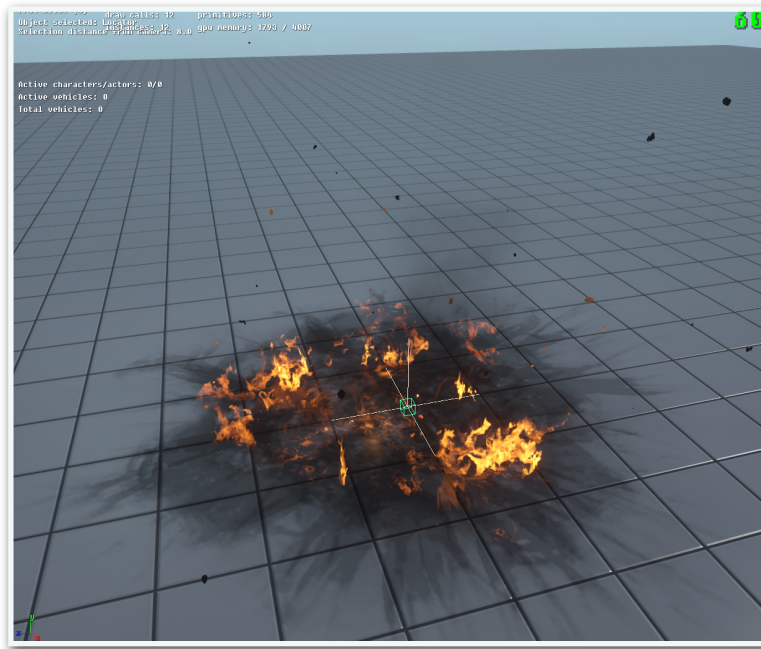
Fear Zones

- Pathfinding obstacle:
Don't walk in
- Fear zone: If in, run out



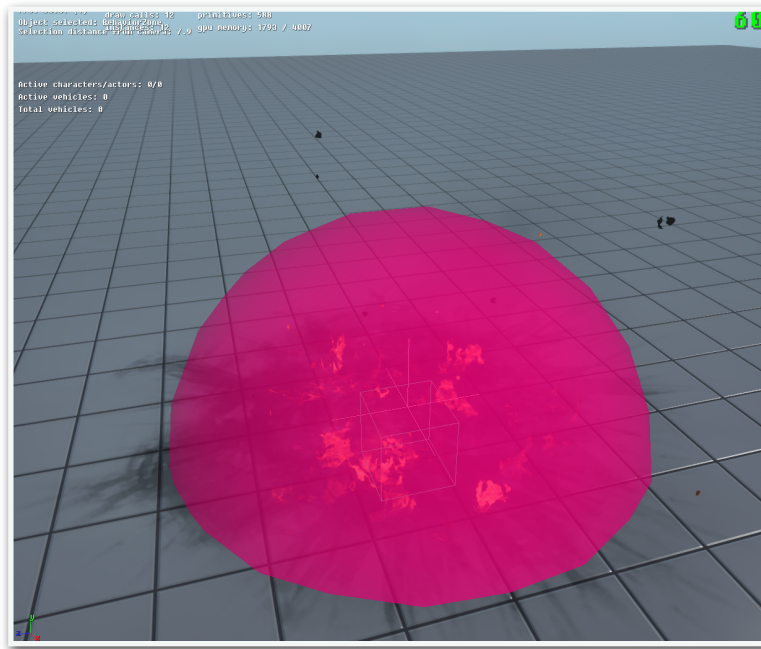
Fear Zones

- Pathfinding obstacle:
Don't walk in
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Fear Zones

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Fear Zones

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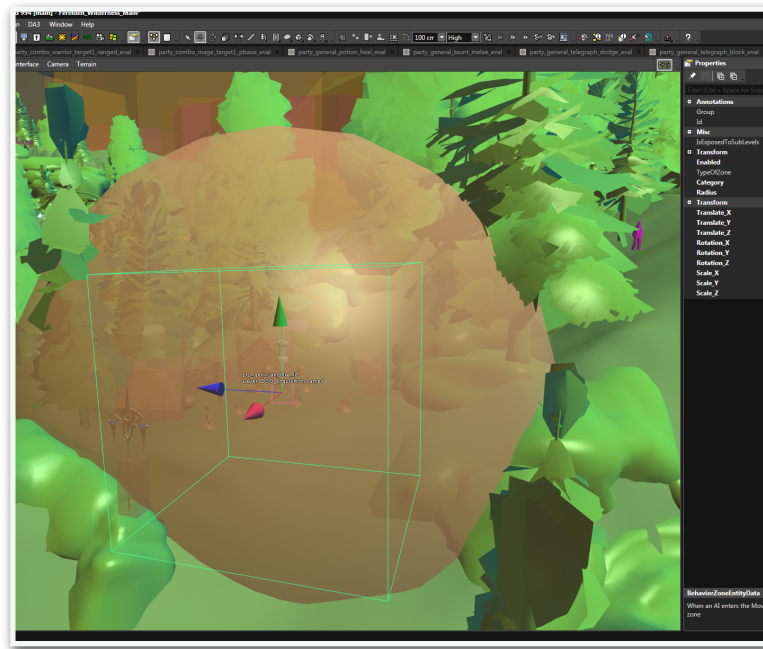
Problem: Stand-off in Bear Town

- Fear zones keep the bears out of camp



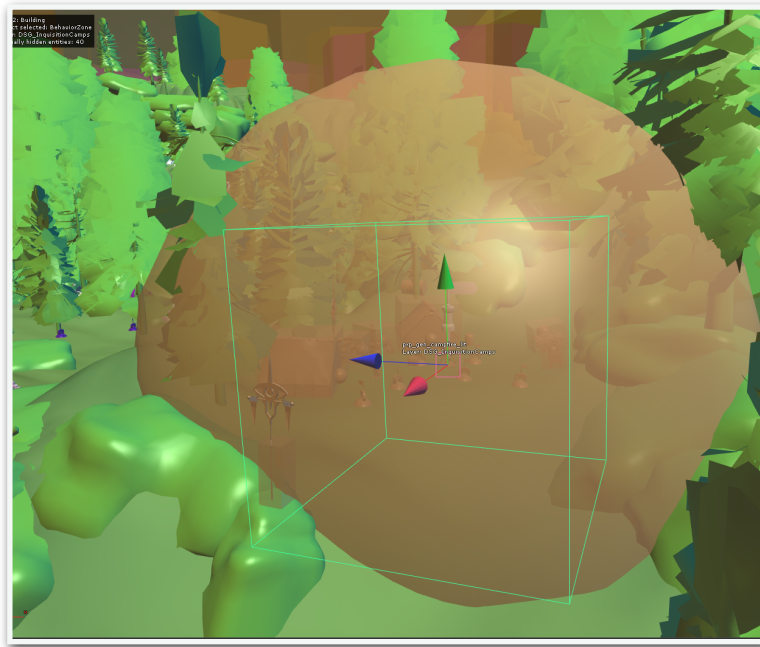
Problem: Stand-off in Bear Town

- Fear zones keep the bears out of camp



Truce in Bear Town

- Bear drops perception of characters in fear zone
- Party drops out of combat when bear exits combat



Problem: Player Off Pathfinding

- Permissive player movement approach
- Player can go places that the AI can't follow









Party Off The Navmesh

- Whenever a party member becomes AI controlled, teleport to nearest navmesh point









Player Outruns The AI

- Leash distance teleport
- Try to position behind the camera
- Disabled or expanded in certain circumstances

Problem: Party Aggression Rules

- Opportunistic targeting
- Target-rich environment
- Player needs control



Party Aggression Rules

- Don't engage unless
 - Someone in the party did damage
 - Someone in the party took damage
- Only target creatures targeting the party

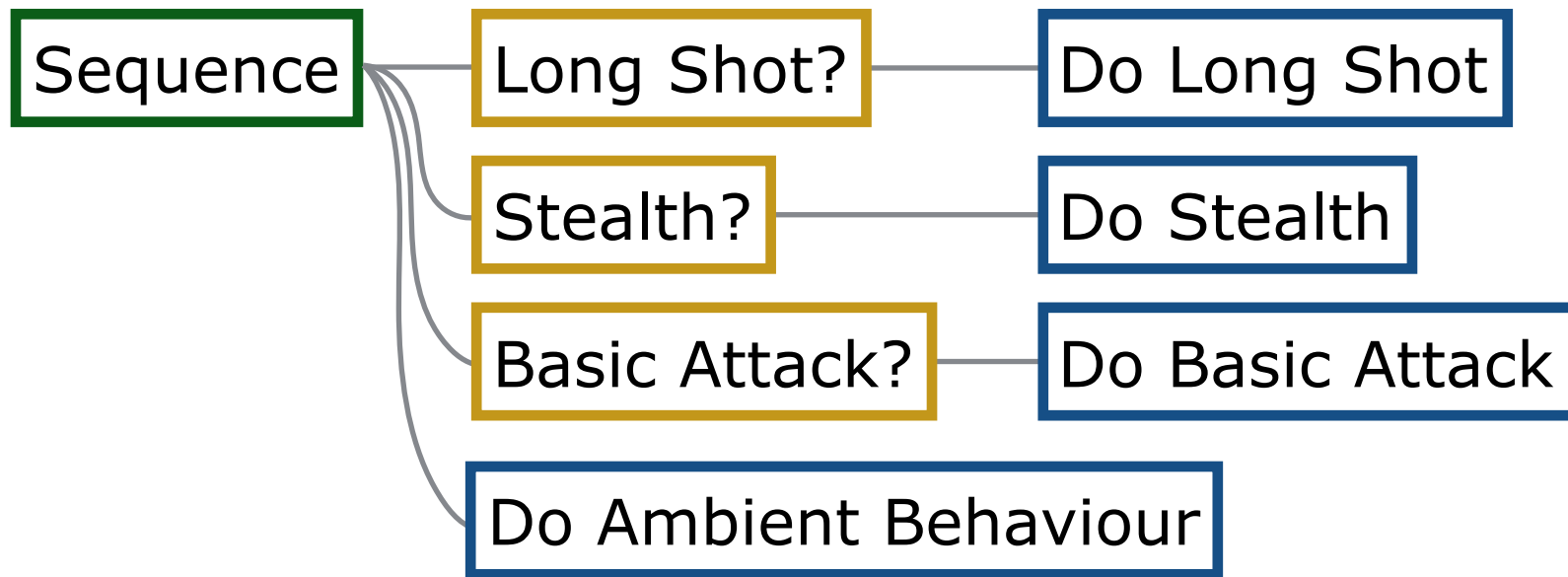


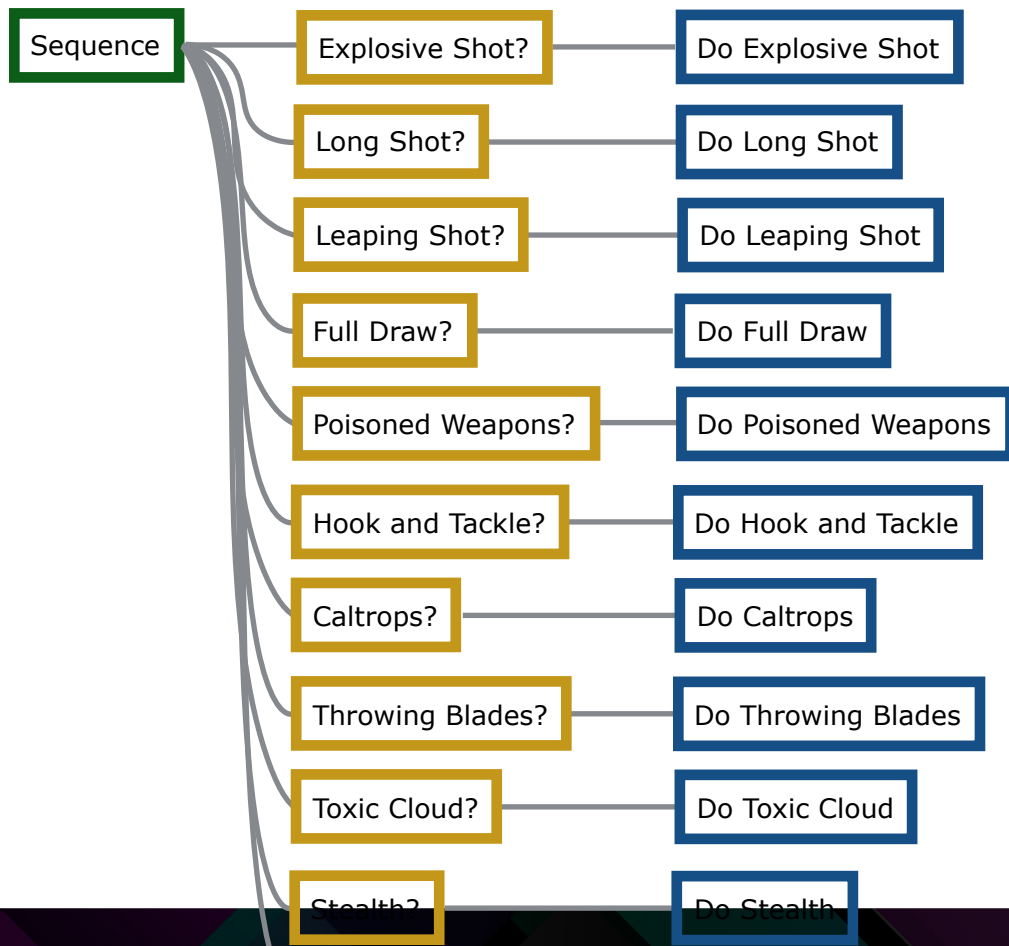
Behaviour Decision System

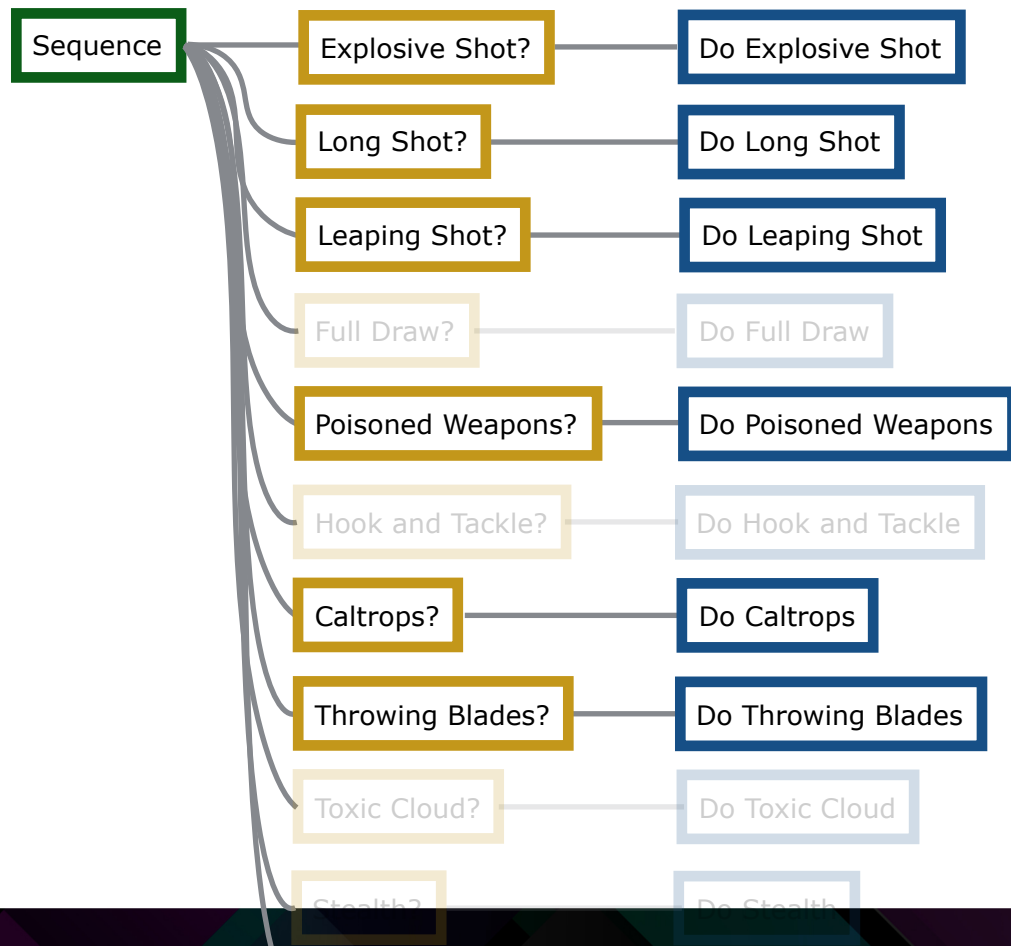
Problem: Party Ability Selection

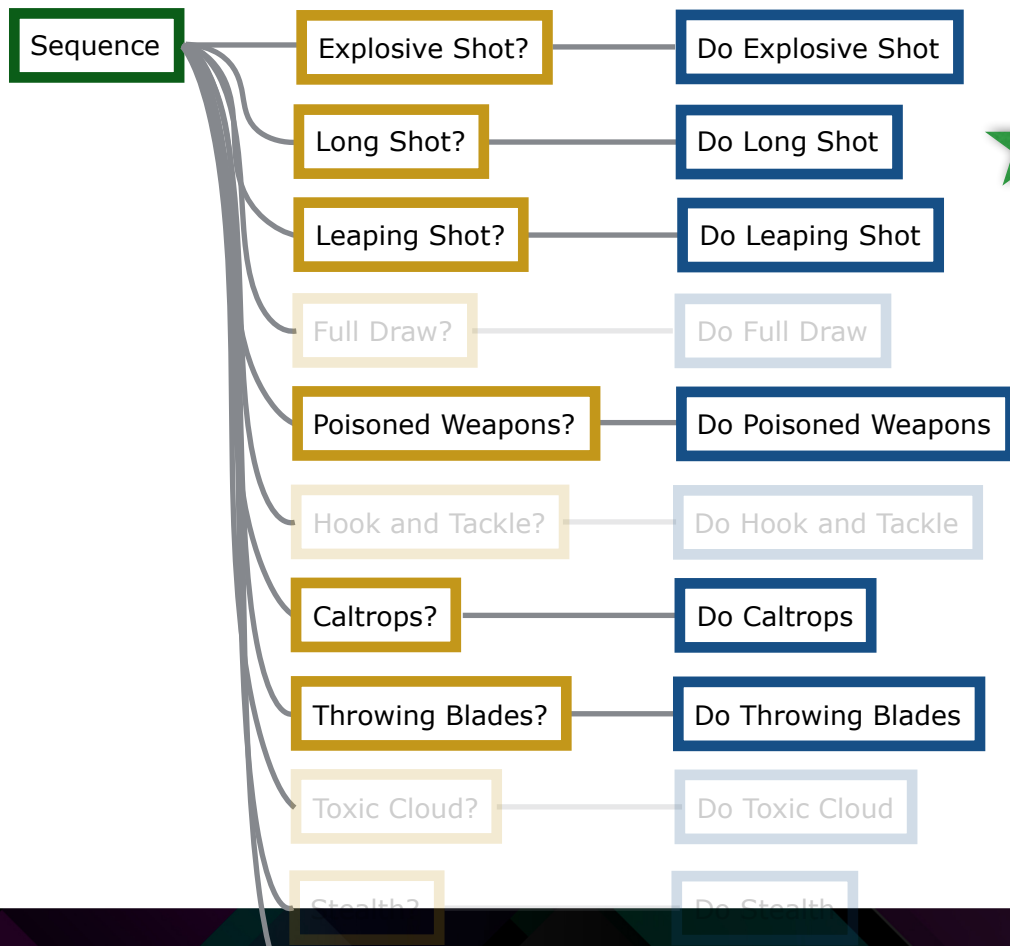
- 30 abilities per class
- 8 active slots
- Progression unlocks
- Static decision tree inadequate

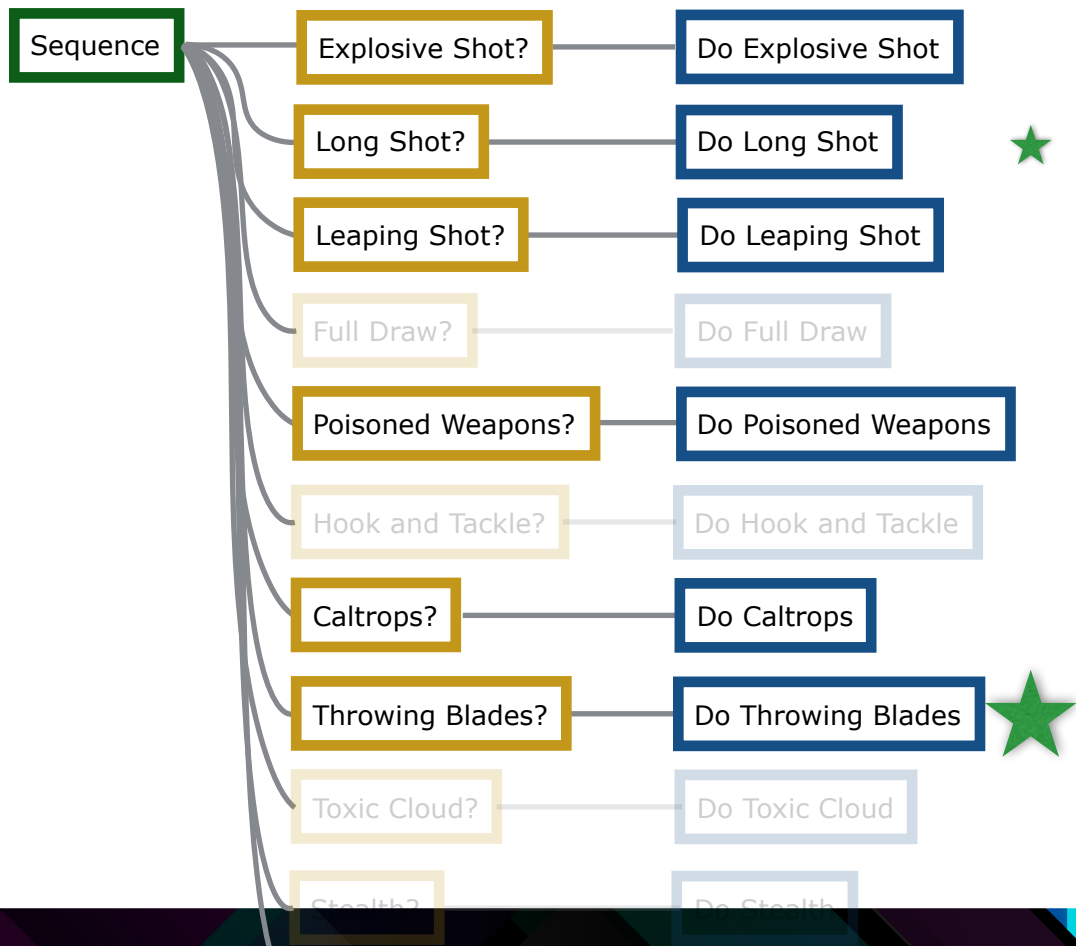


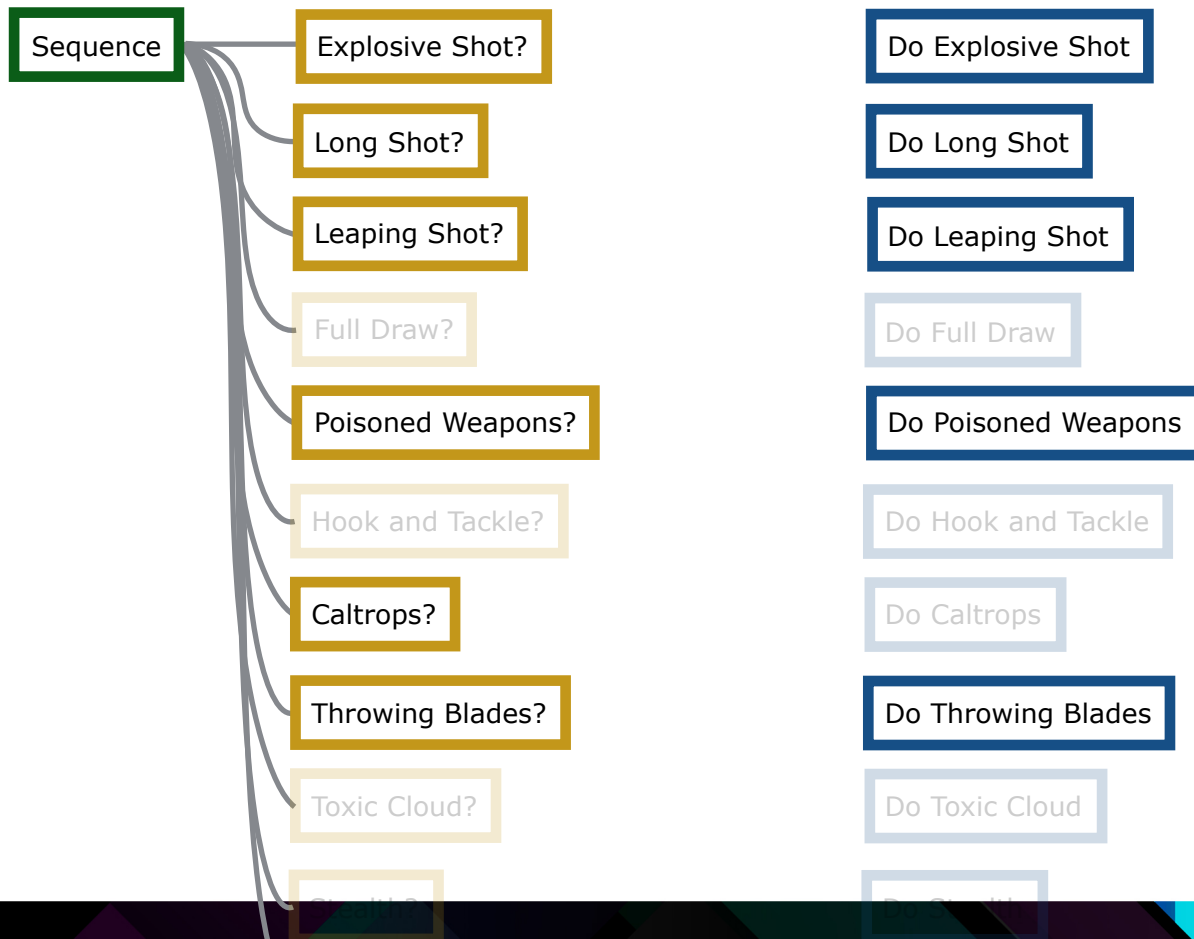


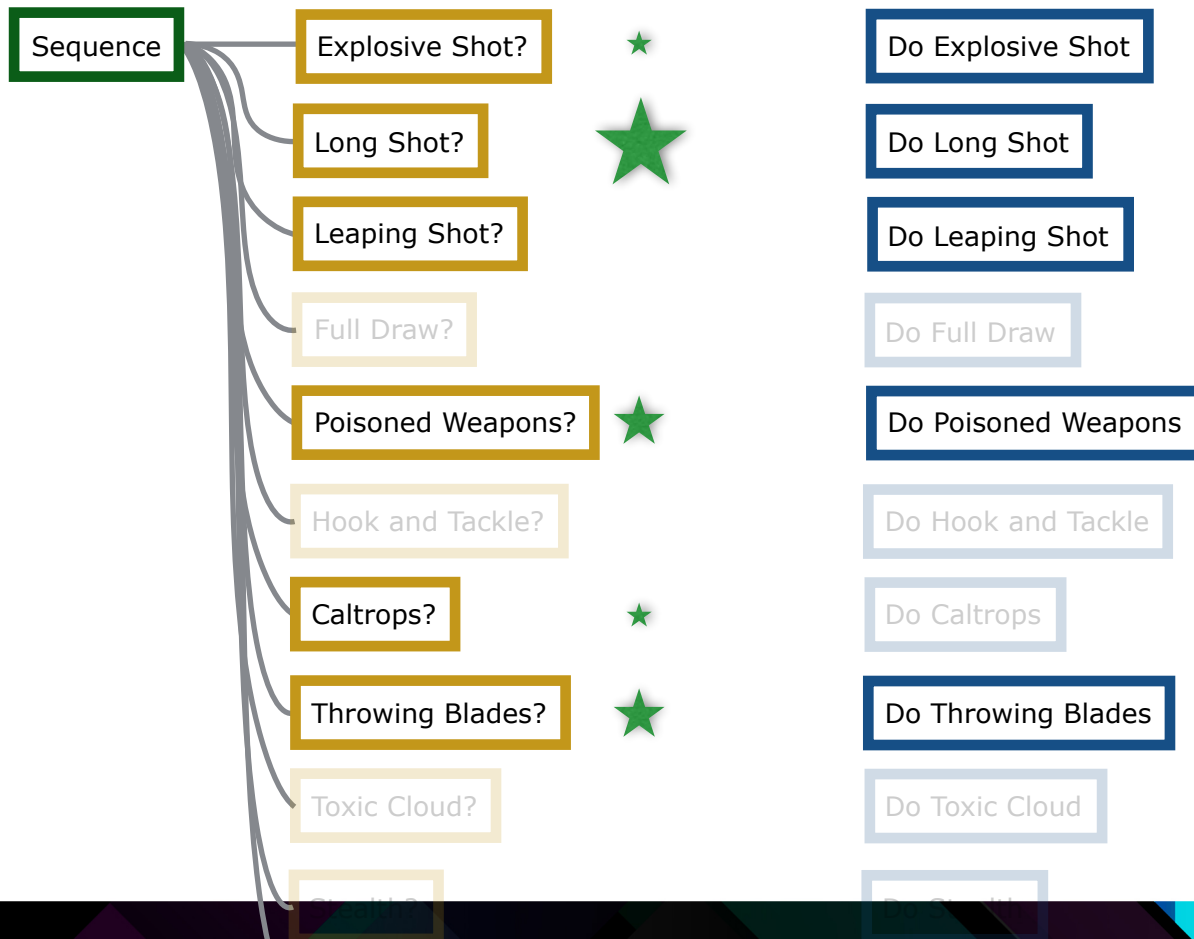


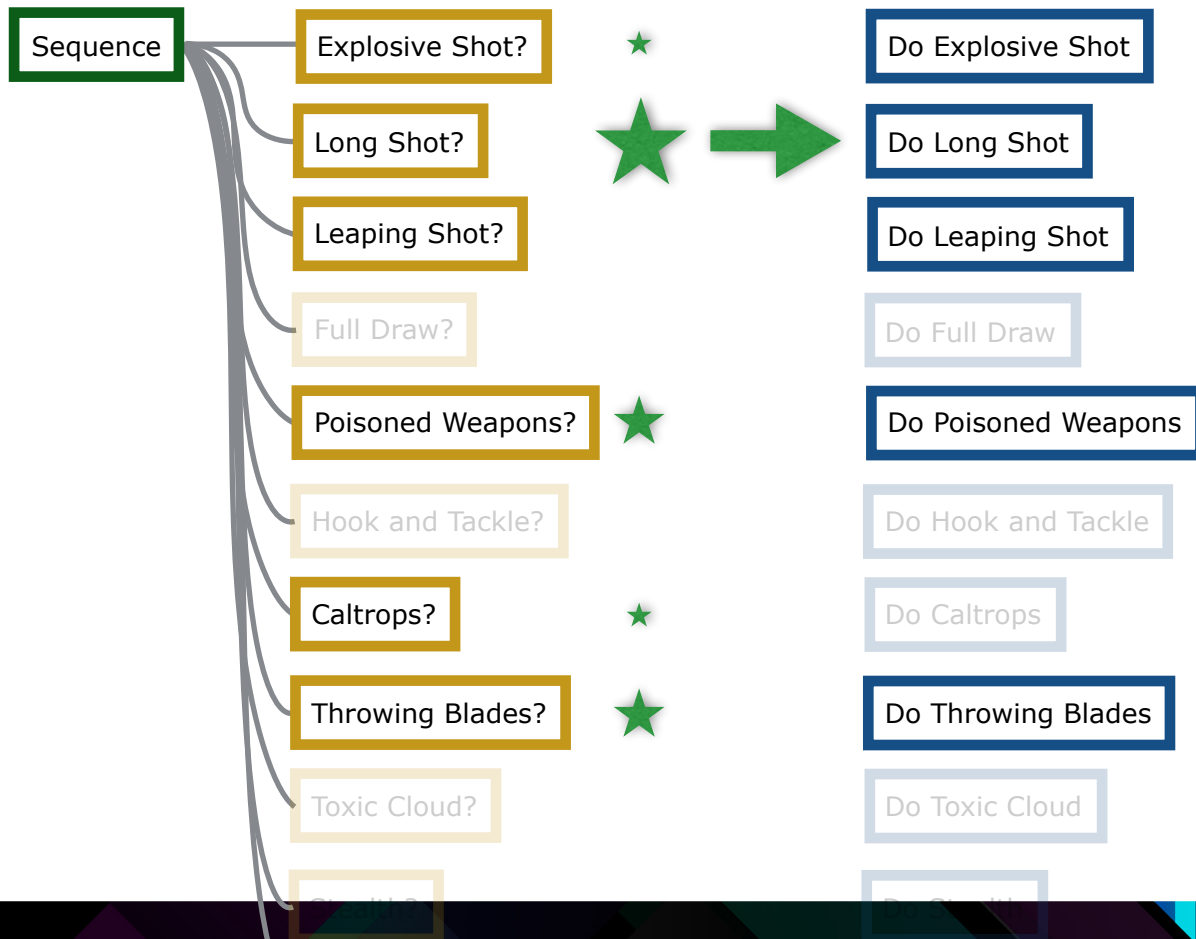












Behaviour Decision System

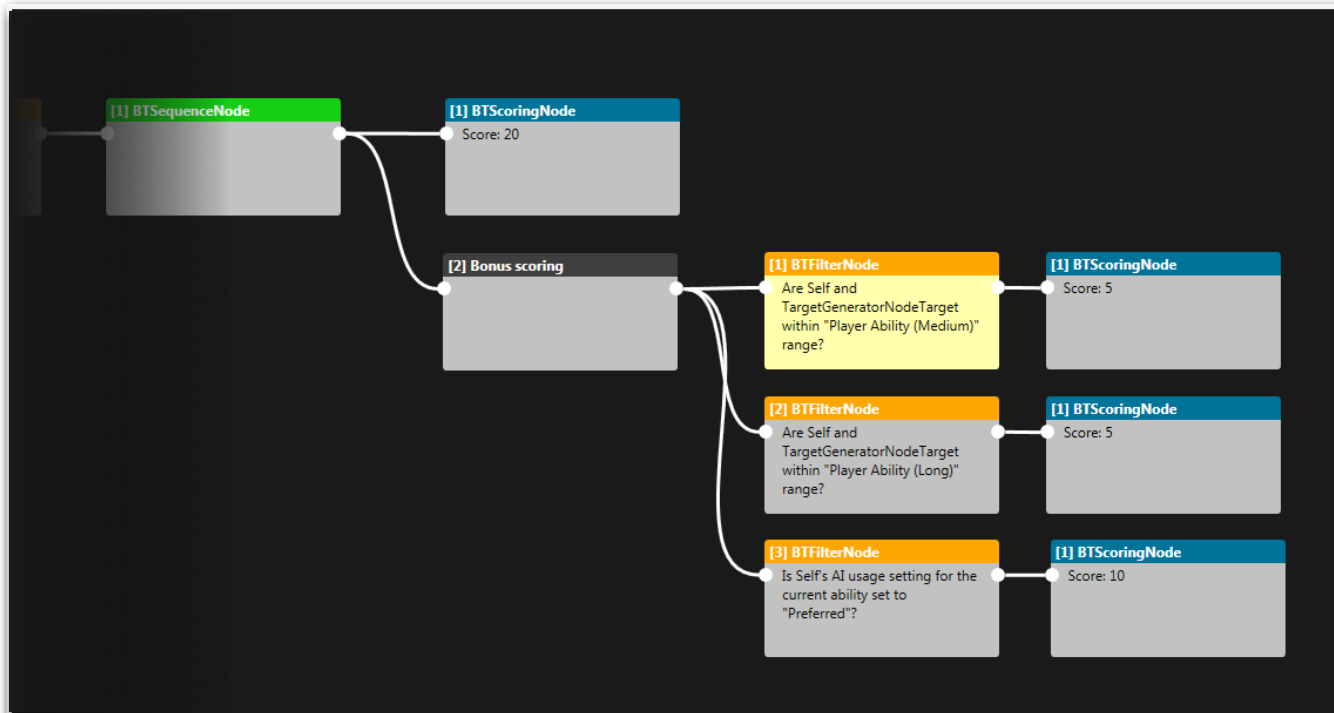
- AI evaluation in 2 phases
 - Evaluate all options
 - Execute the best
- Each ability specifies
 - Evaluation: "Why"
 - Execution: "How"

Long Shot

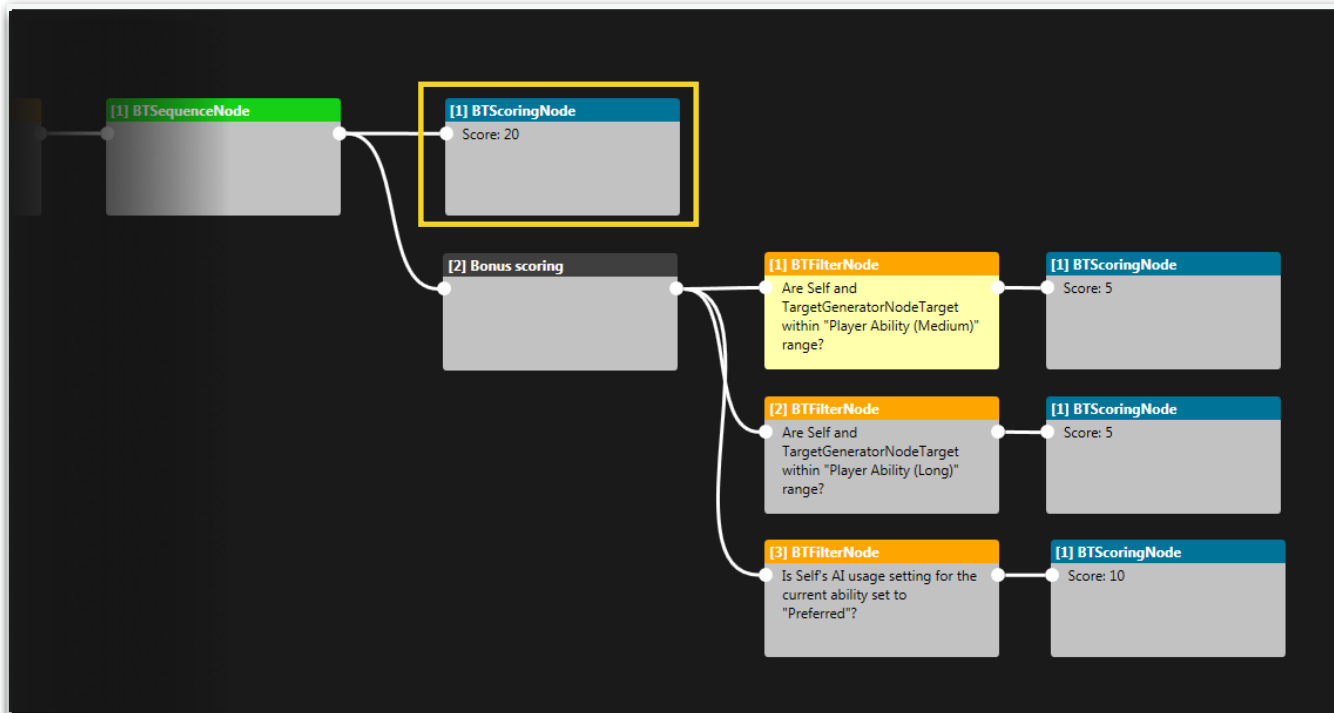
Evaluate

Execute

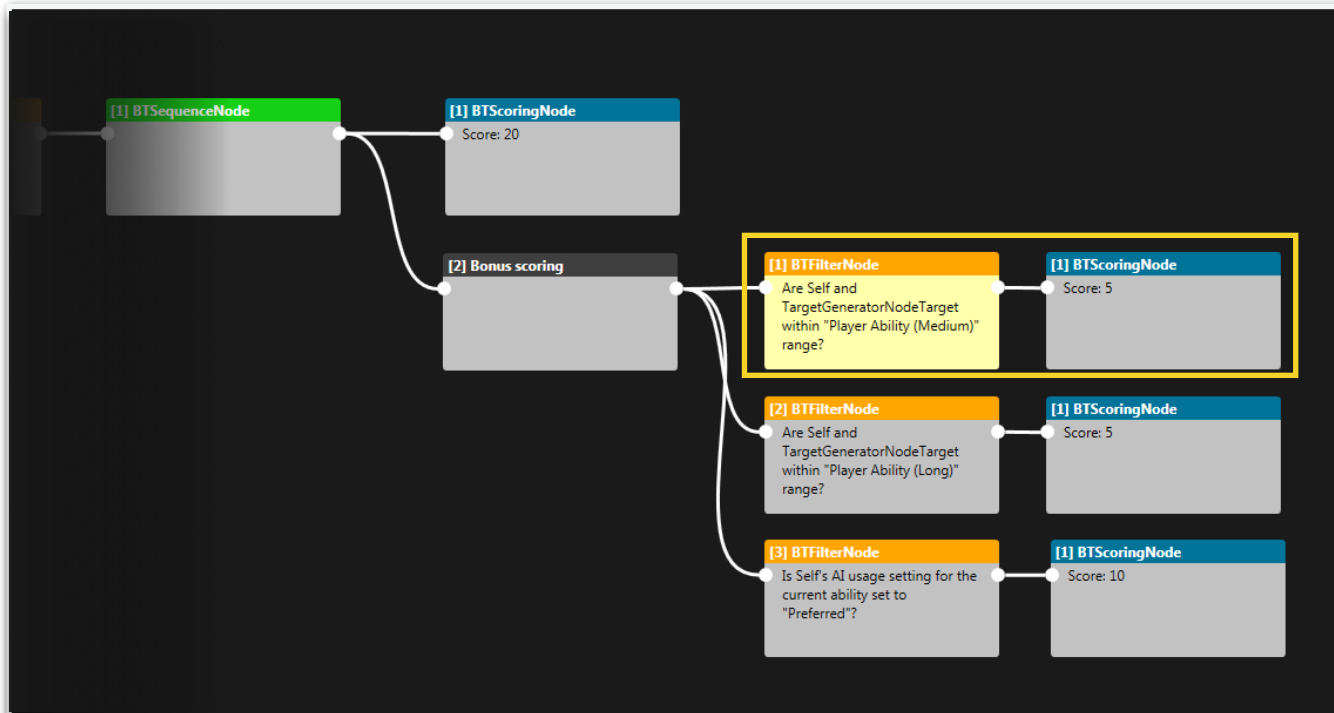
Evaluation



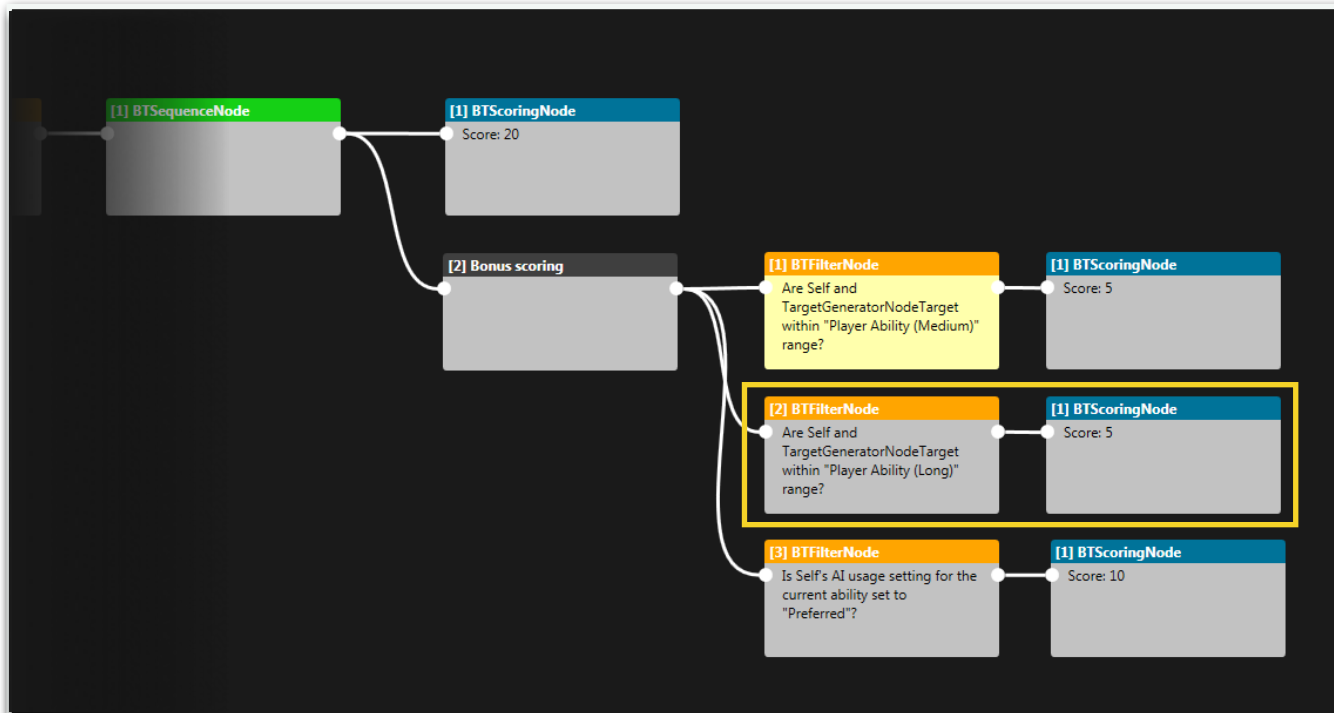
Evaluation



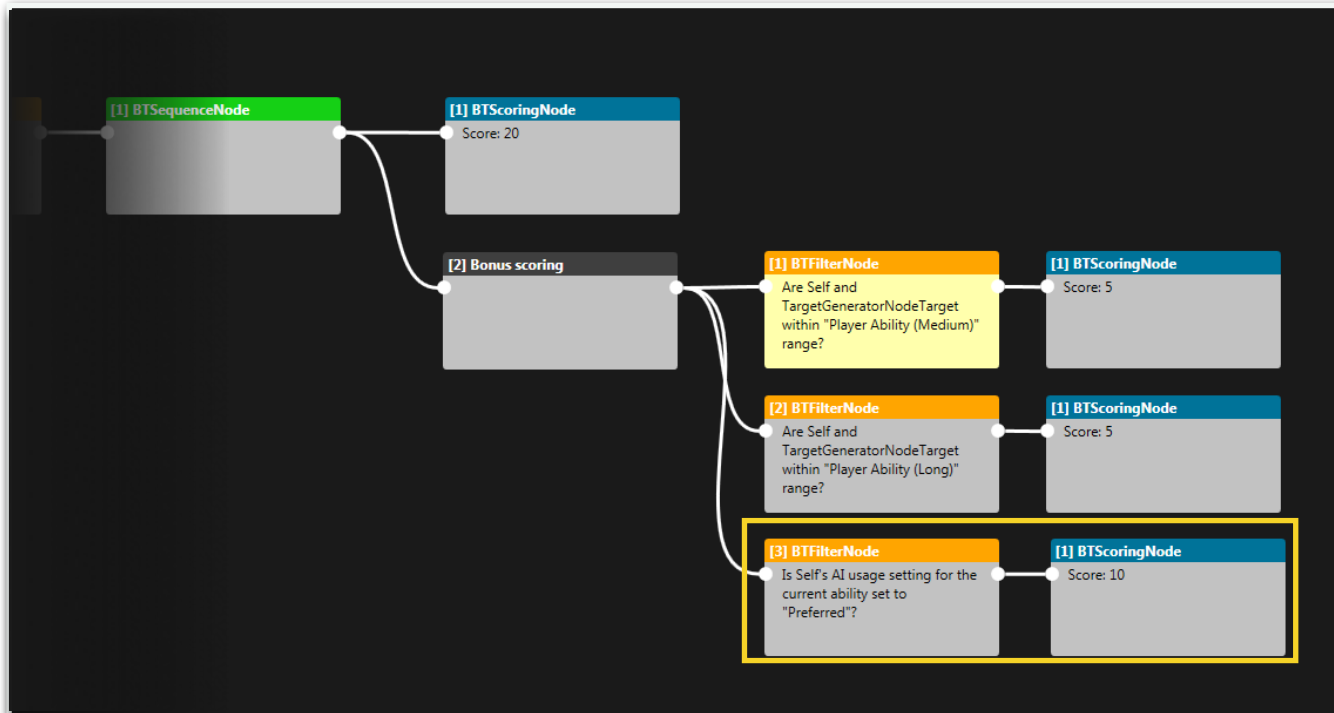
Evaluation



Evaluation



Evaluation



Relative Scoring

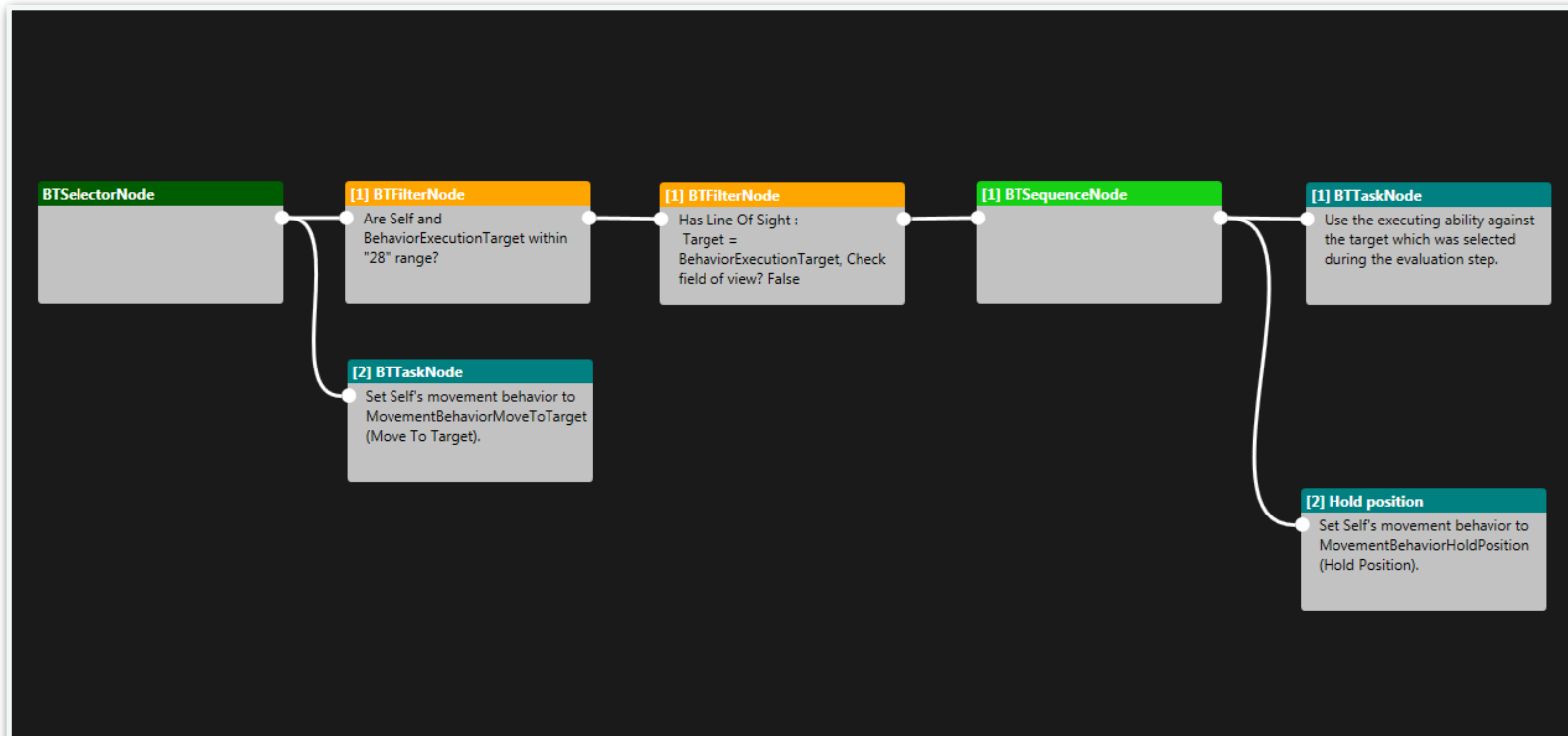
	min	max
Passive Movement	<0	
Basic Attack	10	
Offensive Abilities	20	40
Support Abilities	25	45
Reaction Abilities	60	80

- 10 points for context
- 10 points for preference

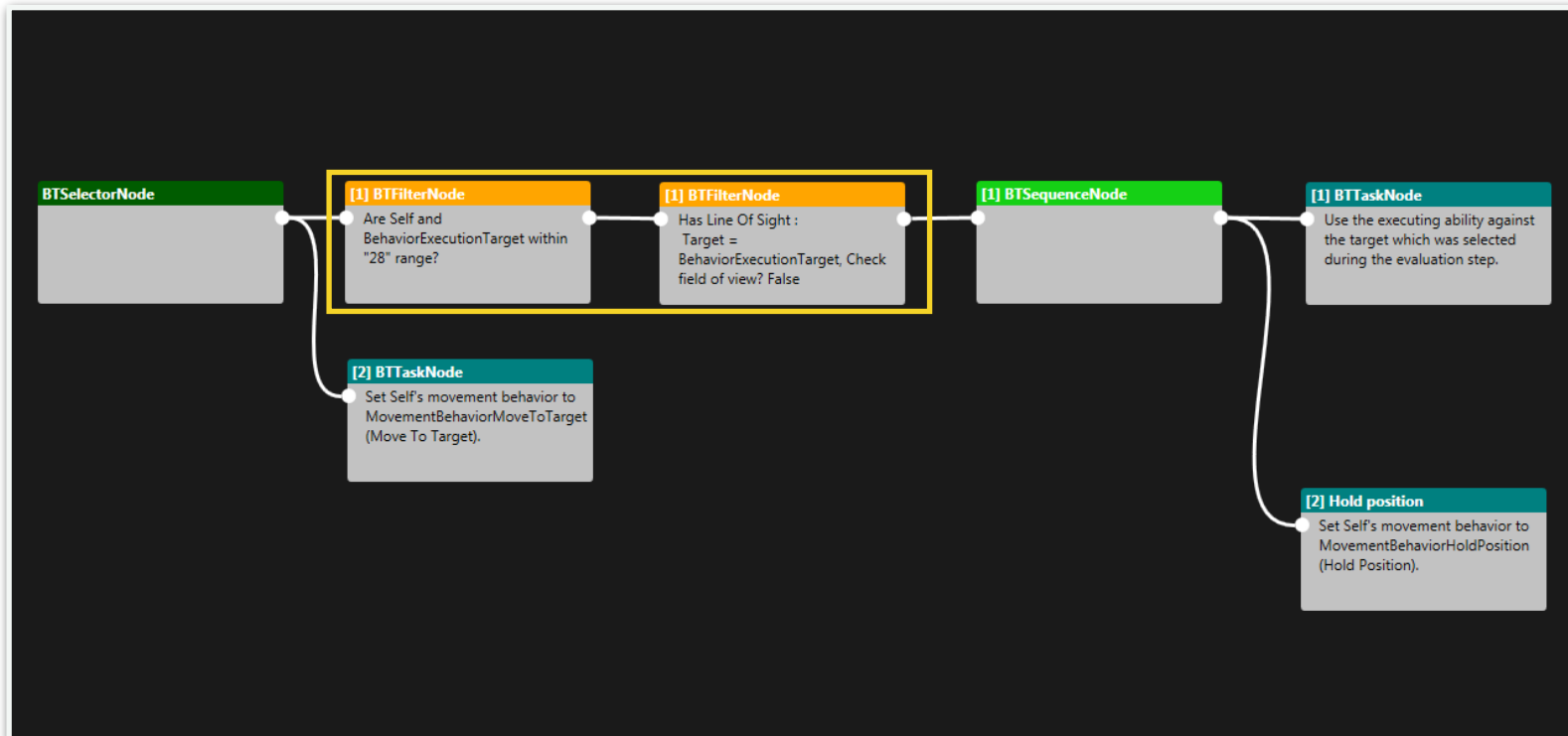
BDS Result Table

Ability	Score	Target
Basic Attack	10	Selected Enemy
Long Shot	30	Selected Enemy
Poison Weapons	25	Self
Full Draw	<i>On Cooldown</i>	
Caltrops	22	Self
Healing Potion	<i>Failed Evaluation</i>	

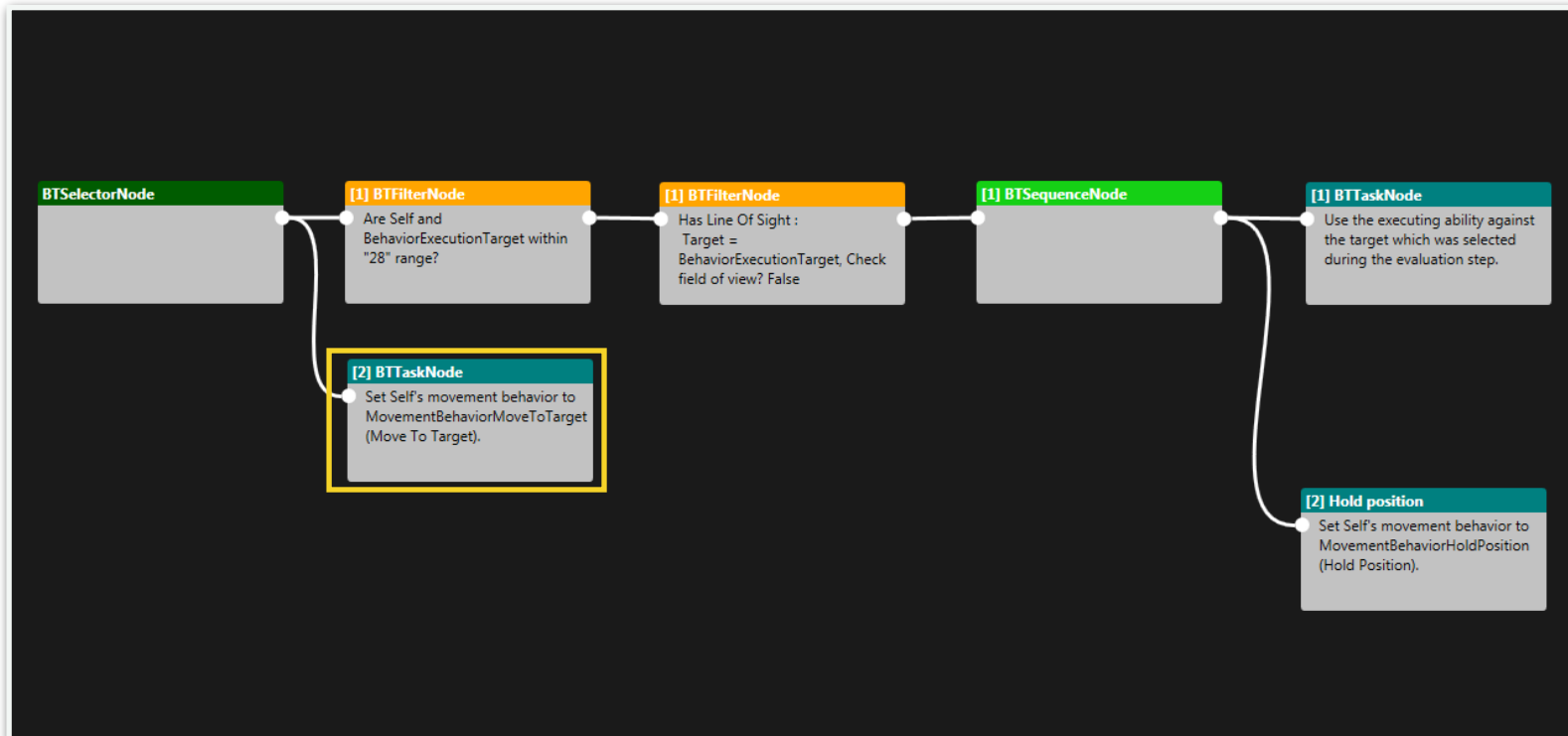
Execution



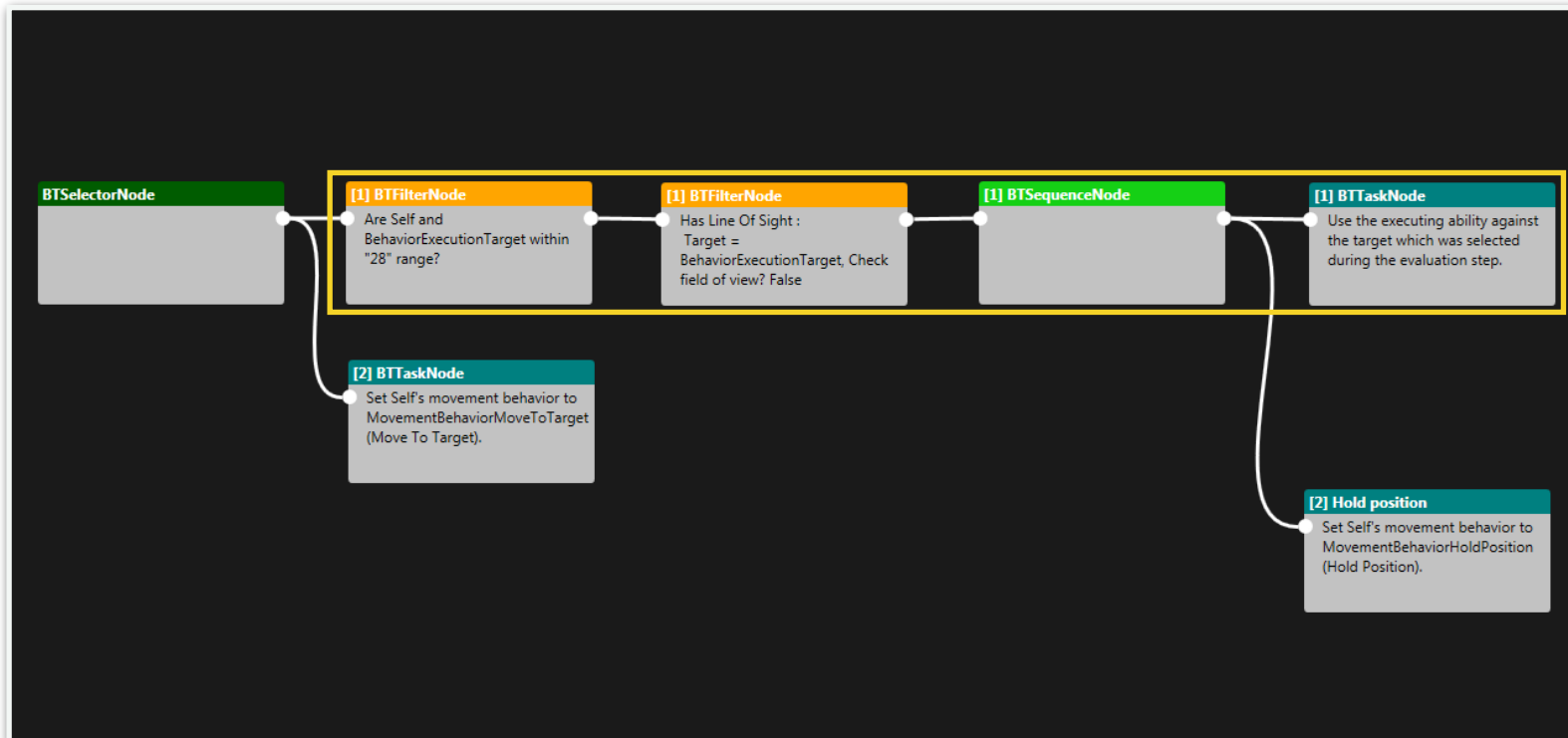
Execution



Execution

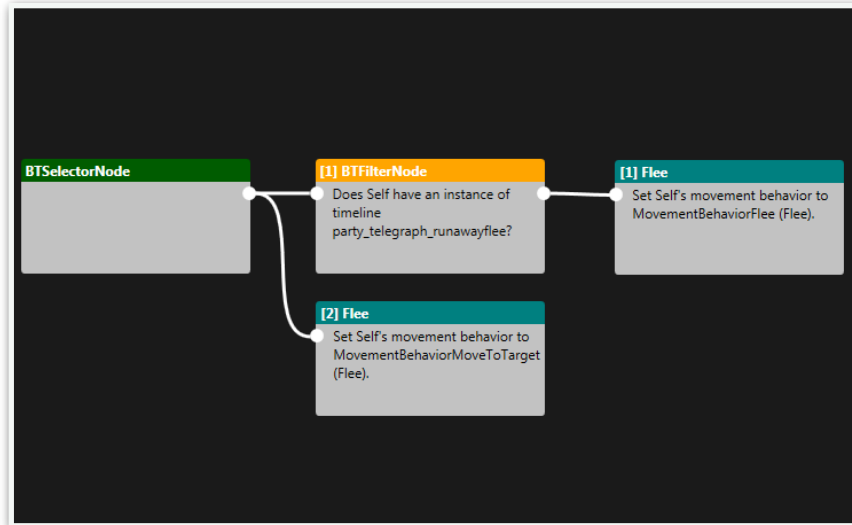


Execution



BDS for Movement

- Prioritizing general movement behaviours
 - Combat follow
 - Exploration follow
 - Tether return-home
 - Fear zone avoidance



Behaviour Decision System

- Add and remove abilities
- Scoring means evaluation order is irrelevant
- Leverage the existing library of functionality

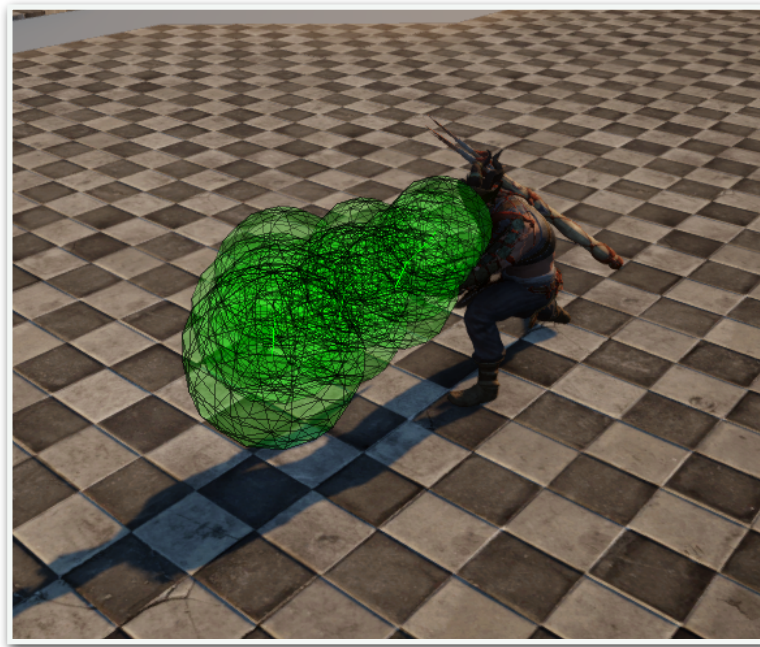
Problem: Reaction Abilities

- **Parry:** A reaction that gives you an advantage
- **Block:** A reaction that leaves you in place
- **Dodge:** A reaction that moves you



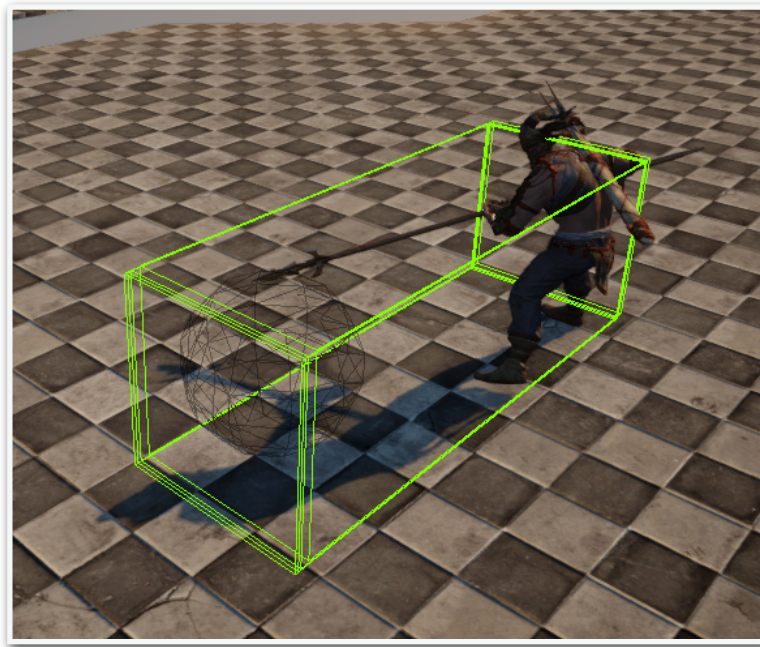
Attack Telegraphs

- Pre-collision applies “telegraph”
- Reaction AI based on parry/block/dodge
- Extra high priority
- Shared cooldown prevents perfect play



Attack Telegraphs

- Pre-collision applies “telegraph”
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Problem: Party AI Customization

- Good baseline experience
- Support the player
- Observable choices



Ability Use Control

- Ability Selection



Ability Use Control

- Ability Selection
- Disable



Ability Use Control

- Ability Selection
- Disable
- Enable



Ability Use Control

- Ability Selection
- Disable
- Enable
- Prefer



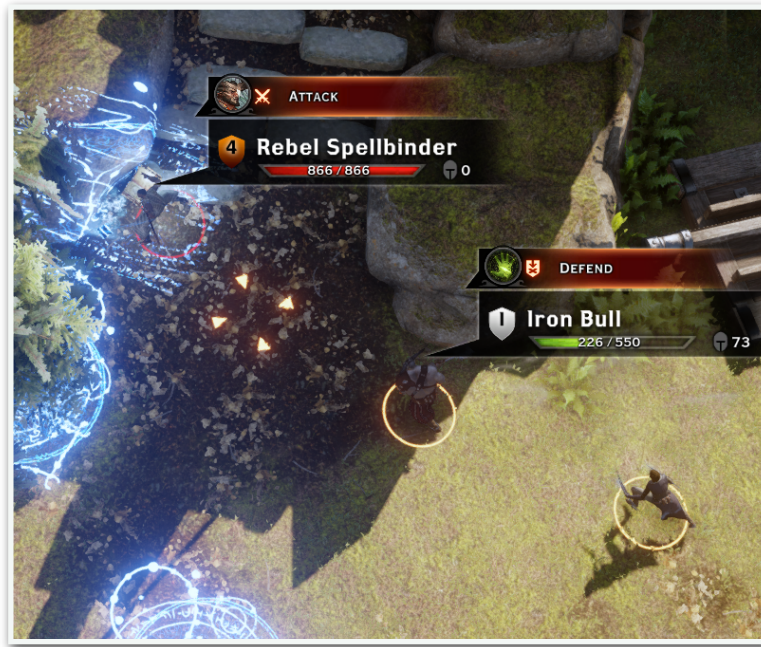
Party Tactics: Targeting Rules

- Follow Character
 - Track character's interactions
- Defend Character
 - Counter threats to character



Problem: Tactical Party Control

- AI support for Tac-Cam
- Direct commands
- Behaviour commands



Direct Commands

- Move Here, Use Ability
- Simple execution
- AI decisions suspended until command completes



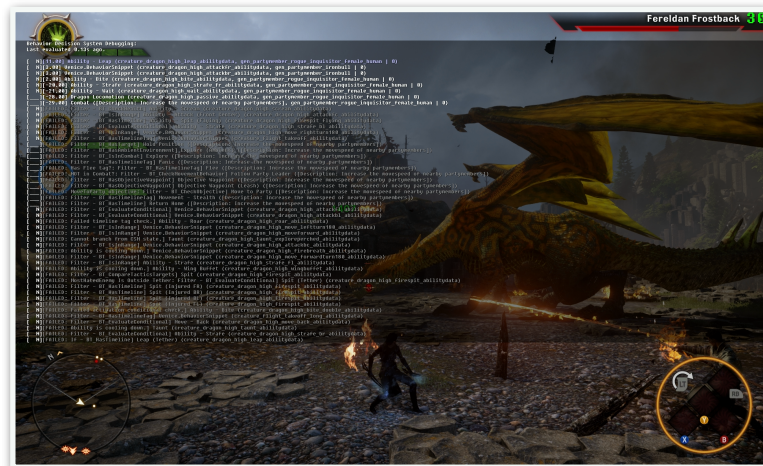
Behaviour Commands

- Modify target and ability picking
- Attack This Enemy
- Hold Position
- Defend This Ally



Benefit: BDS for Creatures

- Iteration speed
- Creature variations
- Complex dragons





Behavior Decision System Debugging:
Last evaluated 0.13s ago.

```
[ N|11.00] Ability - Leap (creature.dragon.high.leap.abilitydata, gen.party.member.rogue.inquisitor.female.human | 0)
[ N|13.00] Venice.BehaviorSnippet (creature.dragon.high.attack.br.abilitydata, gen.party.member.ironbull | 0)
[ N|13.00] Venice.BehaviorSnippet (creature.dragon.high.attack.br.abilitydata, gen.party.member.ironbull | 0)
[ N|2.00] Ability - Bite (creature.dragon.high.bite.abilitydata, gen.party.member.rogue.inquisitor.female.human | 0)
[ N|20.00] Ability - Strafe (creature.dragon.high.strafe.br.abilitydata, gen.party.member.rogue.inquisitor.female.human | 0)
[ N|21.00] Ability - Spit (creature.dragon.high.spit.abilitydata, gen.party.member.rogue.inquisitor.female.human | 0)
[ N|28.00] Dragon.Locomotion (creature.dragon.high.passive.abilitydata, gen.party.member.rogue.inquisitor.female.human | 0)
[ N|29.00] Combat ((Description: Increase the movespeed of nearby party members), gen.party.member.rogue.inquisitor.female.human | 0)
[ N|FAILED: Filter - BT.CheckHealth] Ability - Screen (creature.dragon.high.screen.abilitydata)
[ N|FAILED: Filter - BT.IsInRange] Ability - Attack (front center) (creature.dragon.high.attack.br.abilitydata)
[ N|FAILED: Filter - BT.HasLineOfSight] Ability - Fly (creature.dragon.high.firepit.fly.abilitydata)
[ N|FAILED: Filter - BT.EvaluateConditional] Ability - Strafe (creature.dragon.high.strafe.br.abilitydata)
[ N|FAILED: Filter - BT.IsInRange] Venice.BehaviorSnippet (creature.dragon.high.move.rightturn180.abilitydata)
[ N|FAILED: Filter - BT.HasTimelineTag] Venice.BehaviorSnippet (creature.flight.takeoff.abilitydata)
[ N|FAILED: Filter - BT.HasTarget] Hold Position ((Description: Increase the movespeed of nearby party members))
[ N|FAILED: Filter - BT.HasAmbientEnvironment] Explore (noise) ((Description: Increase the movespeed of nearby party members))
[ N|FAILED: Filter - BT.IsInCombat] Explore ((Description: Increase the movespeed of nearby party members))
[ N|FAILED: Filter - BT.HasTimelineTag] Panic ((Description: Increase the movespeed of nearby party members))
[ N|FAILED: Has Flow Tag? Filter - BT.HasTimelineTag] Fly ((Description: Increase the movespeed of nearby party members))
[ N|FAILED: NOT in Combat? Filter - BT.CheckMovementBehavior] Follow Party Leader ((Description: Increase the movespeed of nearby party members))
[ N|FAILED: Filter - BT.HasObjectiveWaypoint] Objective Waypoint ((Description: Increase the movespeed of nearby party members))
[ N|FAILED: Filter - BT.HasObjectiveWaypoint] Objective Waypoint (Leash) ((Description: Increase the movespeed of nearby party members))
[ N|FAILED: MoveToParty Objective? Filter - BT.CheckObjective] Move to Party ((Description: Increase the movespeed of nearby party members))
[ N|FAILED: Filter - BT.HasTimelineTag] Movement - Stealth ((Description: Increase the movespeed of nearby party members))
[ N|FAILED: Filter - BT.HasTimeline] Return Home ((Description: Increase the movespeed of nearby party members))
[ N|FAILED: Filter - BT.EvaluateConditional] Venice.BehaviorSnippet (creature.dragon.high.attack.br.abilitydata)
[ N|FAILED: Filter - BT.EvaluateConditional] Venice.BehaviorSnippet (creature.dragon.high.attack.br.abilitydata)
[ N|FAILED: Filter - BT.EvaluateConditional] Ability - Roar (creature.dragon.high.roar.abilitydata)
[ N|FAILED: Filter - BT.IsInRange] Venice.BehaviorSnippet (creature.dragon.high.move.leftturn180.abilitydata)
[ N|FAILED: Filter - BT.IsInRange] Venice.BehaviorSnippet (creature.dragon.high.move.forward.abilitydata)
[ N|FAILED: Cannot branch from CSM state.] Taunt (creature.dragon.high.taunt.explore.perched.abilitydata)
[ N|FAILED: Filter - BT.IsInRange] Venice.BehaviorSnippet (creature.dragon.high.attack.br.abilitydata)
[ N|FAILED: Ability is cooling down.] Venice.BehaviorSnippet (creature.dragon.high.firebreath.abilitydata)
[ N|FAILED: Filter - BT.IsInRange] Venice.BehaviorSnippet (creature.dragon.high.move.forwardturn180.abilitydata)
[ N|FAILED: Filter - BT.IsInRange] Ability - Strafe (creature.dragon.high.strafe.br.abilitydata)
[ N|FAILED: Ability IS cooling down.] Ability - Wing Buffet (creature.dragon.high.wingbuffet.abilitydata)
[ N|FAILED: Filter - BT.CompareFactSet] Spit (creature.dragon.high.firepit.abilitydata)
[ N|FAILED: MostHatedEnemy Is Outside Tether: Filter - BT.EvaluateConditional] Spit (tether) (creature.dragon.high.firepit.abilitydata)
[ N|FAILED: Filter - BT.HasTimeline] Spit (injured FR) (creature.dragon.high.firepit.abilitydata)
[ N|FAILED: Filter - BT.HasTimeline] Spit (injured BR) (creature.dragon.high.firepit.abilitydata)
[ N|FAILED: Filter - BT.HasTimeline] Spit (injured BL) (creature.dragon.high.firepit.abilitydata)
[ N|FAILED: Filter - BT.HasTimeline] Spit (injured FL) (creature.dragon.high.firepit.abilitydata)
[ N|FAILED: Failed activation conditional check.] Ability - Bite (creature.dragon.high.bite.double.abilitydata)
[ N|FAILED: Filter - BT.HasTimelineTag] Venice.BehaviorSnippet (creature.flight.takeoff.long.abilitydata)
[ N|FAILED: Filter - BT.EvaluateConditional] Move - Back (creature.dragon.high.move.back.abilitydata)
[ N|FAILED: Ability is cooling down.] Taunt (creature.dragon.high.taunt.abilitydata)
[ N|FAILED: Filter - BT.EvaluateConditional] Ability - Strafe (creature.dragon.high.strafe.br.abilitydata)
[ N|FAILED: If - BT.HasTimeline] Leap (tether) (creature.dragon.high.leap.abilitydata)
```

Thanks

- Sebastian Hanlon
- @hanlsp on Twitter

